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AUTOMOTIVE and Aviation INDUSTRIES

Published Semi-Monthly

Volume 87 Number 4

CONTENTS

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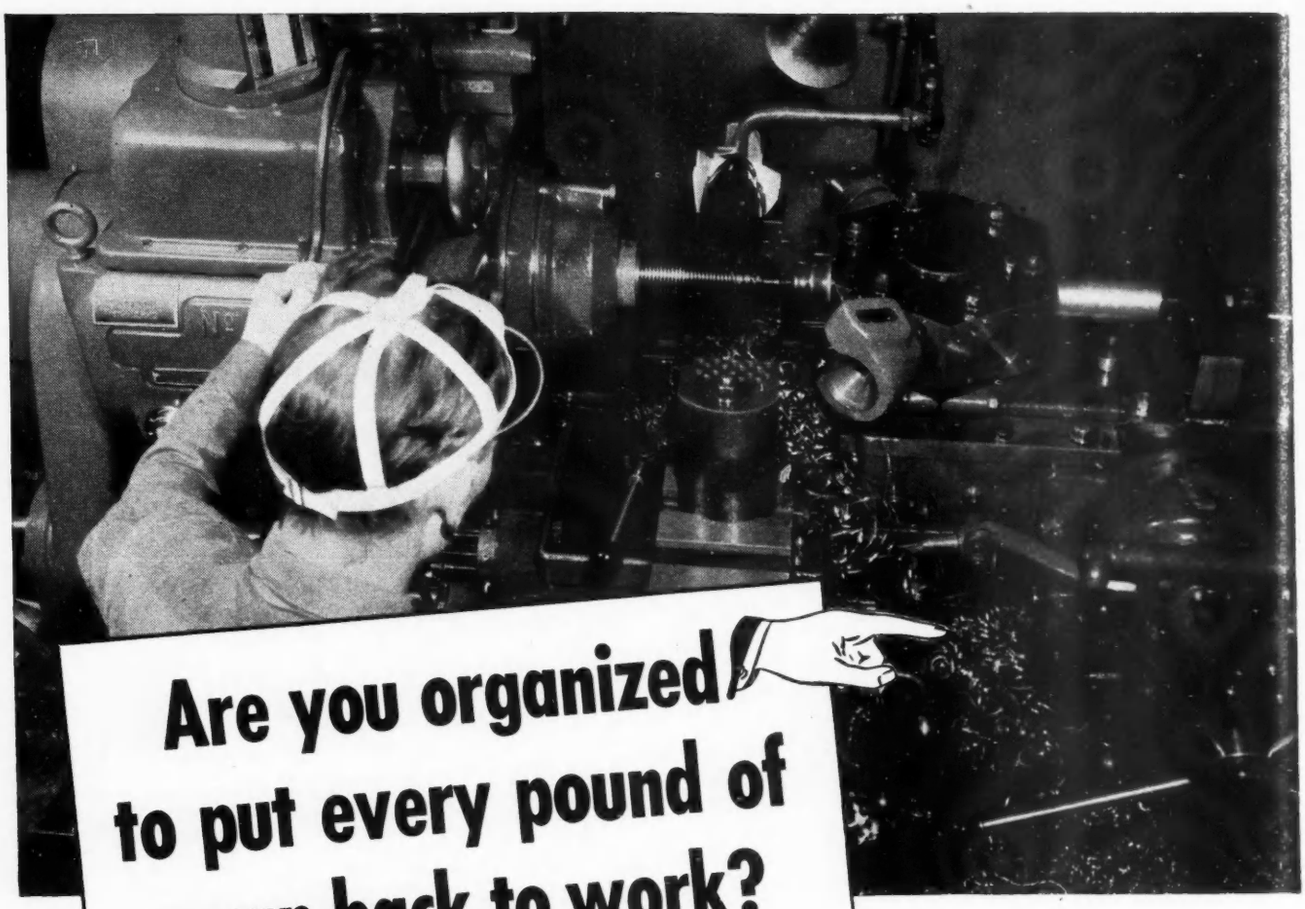

Are you organized to put every pound of scrap back to work?

STEEL MILLS MUST HAVE 140,000 TONS A DAY TO KEEP PACE WITH WAR PRODUCTION

WAR has a bottomless appetite for steel. This year our industry must produce even more steel than it did last year, which was the biggest year in history. This means not only more pig iron—but more scrap iron—at least six million extra tons of it!

Where is this "extra" scrap? Part of it may be on your premises! We know your industry is thoroughly modernized — that you realize the value of scrap and provide regular systems for collecting it. But usual methods aren't enough to meet this crisis. It will take special diligence on the part of management and workers alike to put the 1942 Scrap Drive over the top. To check the efficiency of your scrap-collecting system, see if you're regularly rounding up all scrap in these classifications:

"BREAD-AND-BUTTER" SCRAP—The kind you sell regularly—filings, rejects, shavings, stampings—metal scrap created in the process of manufacture.

DORMANT SCRAP—Unused or abandoned equipment, broken, or worn-out machine parts, dies, electrical equipment, etc.—the "junk" that accumulates but often misses routine scrap collection.

"RAINY DAY" SCRAP—the hardest of all to part with. Includes obsolete machinery, outdated tools, jigs, fixtures, stocks, etc.—idle now because they're being saved for possible use in some indefinite future emergency. This metal should be scrapped, unless it can be reconditioned and put to work now.

If you haven't already, we suggest you organize your own scrap drive. Your local Industrial Salvage Committee will help you plan a forceful program. Put some one individual in charge of salvage in all departments, and give him authority to act. Promote the drive to your employees with posters and prizes. Emphasize speed and continuous effort. Make them all "scrap conscious." If you need more information, contact the Bureau of Industrial Conservation, War Production Board, Washington, District of Columbia.

Your Scrap is worth its weight in Victory!

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
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UNITED STATES STEEL

IN THIS ISSUE . . .

AUTOMOTIVE and AVIATION INDUSTRIES

Volume 87 August 15, 1942 Number 4

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Accident Facts

Accidents—97 per cent of them preventable—cost the nation $4,000,000,000 in 1941, the National Safety Council announced today in issuing its annual statistical yearbook, ACCIDENT FACTS.

Even more important, the Council said, was the productive time lost through occupational accidents alone. On-the-job accidents killed 18,000 workers, injured 1,600,000, cost $850,000,000 and resulted in the loss of 460,000,000 man-days of work during 1941. This lost time was the equivalent of work that could have been done by 1,500,000 new workers, and came at a time when every hour lost delays war production needed for victory.

All accident totals in 1941 (including occupational) were 102,500 killed, 350,000 permanently disabled and 9,300,000 injured.

Traffic accidents were the largest factor in rolling up the death and injury total, the Council said. Motor vehicles accounted for 40,000 dead, 1,450,000 injured, and a cost of $1,900,000,000.

Accidents in the home ranked next. They killed 31,500, injured 4,650,000 and cost $600,000,000.

"CATERPILLAR" AND MUEHLHAUSEN SPRINGS

Can Take It!

On the job 24 hours every day—"Caterpillar" built tractors are making minutes out of hours on hundreds of war jobs—uprooting huge stumps, plowing through mud, shoving boulders and earth, and then a stretch of "easy going" on dry ground.

Such service demands *instant, accurate* governor control of engine speeds. Sealed within the governor unit, shown at lower left, is one of the many springs Muehlhausen makes for "Caterpillar." It is accurate to a fraction of an ounce, capable of withstanding heat and corrosion. Upon its performance depends the rapidity with which the "Caterpillar" engine responds to suddenly applied loads, and the careful regulation under varying loads. This precision and dependability are the results of close collaboration between Muehlhausen and customer engineers.

Muehlhausen can do the same for you, with springs of every type — compression, extension, torsion or flat — hot or cold formed. For quick action, wire or write today! MUEHLHAUSEN SPRING CORPORATION, 650 Michigan Ave., Logansport, Indiana.

FREE!
TWO NEW FOLDERS

- New Die Spring Bulletin illustrates, describes 208 sizes and types of die springs.
- New Armament Bulletin shows importance of springs for many types of war equipment.

MUEHLHAUSEN SPRINGS

EVERY TYPE AND SIZE

AUTOMOTIVE and AVIATION INDUSTRIES

Published on the 1st and 15th of the month

Vol. 87, No. 4
August 15, 1942

The Alloy Steel Supply

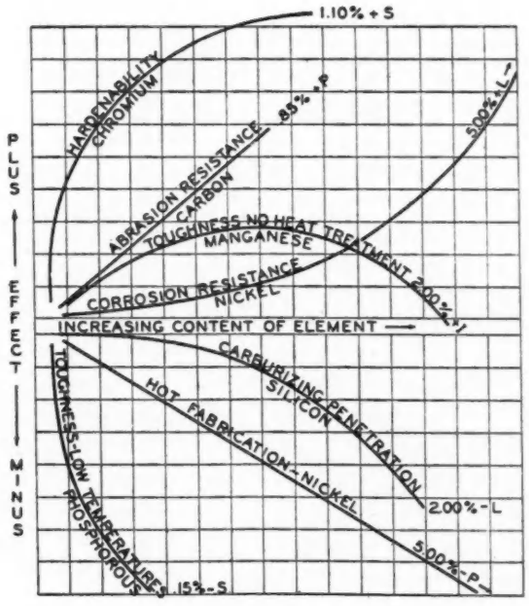
By W. C. Hirsch

SO MANY factors enter into the problem of supplying the nation's steel requirements in the air, on the battlefield and the high seas as well as in those civilian uses, which contribute toward the goal, that the quest for information on this subject has come to be the pivot of all research activity. Gratifying progress has been made in the development of steels, that in the uses to which they are put, they will give satisfactory performance and yet subtract as little as possible from the supply of those alloying elements that are in critically light supply. In some cases even to the point of substituting a suitable heat-treatment to obtain properties, for which until recently alloys were considered indispensable.

This task, a continuing one with ever-changing problems as this or that alloying element must be added to the roster of those that must be conserved for only the most important uses, got under way when the Office of Production Management, forerunner of the War Production Board, handed this difficult assignment to technical committees of the American Iron and Steel Institute working in conjunction with the Society of Automotive Engineers. These organizations have achieved substantial progress in developing steels with relatively little alloy content or none at all, but the vigor of their research is not slackening and tests of special heats now under way promise to enlarge the available choice of what have come to be classified as alternate steels.

It will, therefore, be well for steel users to keep abreast of developments and to bear in mind that there is at no time, particularly not now, such a thing as the last word on any phase of steel metallurgy and technique having been spoken. Specifications have been instituted so that producers and consumers of steel would understand one another, not to halt or even delay progress at a time like this, and the War Production Board's National Emergency Steel Specifications Administration is doing everything possible to facilitate prompt and widest possible acceptance of what modifications are in the interest of the national program.

A by-product of the search for meritorious alloy-lean steels has been a better understanding of what properties are imparted to steel by certain alloys and combinations of alloys (see illustration). Twenty years ago, competent metallurgists frowned upon the use of nickel as an alloy in such small amounts as have come to be standard in the NE 8000 series of the present. At that time the benefits of molybdenum, when used with nickel and chromium, were little known, but today 0.5 per cent nickel in this type of steels is considered as sufficient, bearing in mind that the objective of these NE steels is "to conserve strategic alloying elements" and that for any but uses in the very highest ratings steel mills are dependent for their supply of nickel upon what can be recovered from scrap.



Characteristic influence of elements upon the shape the curves assume when certain properties or conditions of steel are plotted against content of element.

In working out the difficult problem of reconciling the paucity in the supply of some of the principal alloying elements with the need of high quality in armament steels, the American Iron & Steel Institute's metallurgical authorities gave special attention to the carburizing grades that also find wide use in

National Emergency Steels

List of the national emergency steels, NE 8000 series, established to conserve strategic alloying elements where richer alloyed steels are used

Designation	C	Mn	Mo	Ni	Cr
NE 8024	0.22/0.28	1.00/1.30	0.10/0.20	.....	.....
NE 8124	0.22/0.28	1.30/1.60	0.25/0.35	.....	.....
NE 8233	0.30/0.36	1.30/1.60	0.10/0.20	.....	.....
NE 8245	0.42/0.49	1.30/1.60	0.10/0.20	.....	.....
NE 8339	0.35/0.42	1.30/1.60	0.20/0.30	.....	.....
NE 8442	0.38/0.45	1.30/1.60	0.30/0.40	.....	.....
NE 8447	0.43/0.50	1.30/1.60	0.30/0.40	.....	.....
NE 8547	0.43/0.50	1.30/1.60	0.40/0.60	.....	.....
NE 8620	0.18/0.23	0.70/0.95	0.15/0.25	0.40/0.60	0.40/0.60
NE 8630	0.27/0.33	0.70/0.95	0.15/0.25	0.40/0.60	0.40/0.60
NE 8724	0.22/0.28	0.70/0.95	0.20/0.30	0.40/0.60	0.40/0.60
NE 8739	0.35/0.42	0.75/1.00	0.20/0.30	0.40/0.60	0.40/0.60
NE 8744	0.40/0.47	0.75/1.00	0.20/0.30	0.40/0.60	0.40/0.60
NE 8749	0.45/0.52	0.75/1.00	0.20/0.30	0.40/0.60	0.40/0.60
NE 8817	0.15/0.20	0.70/0.95	0.30/0.40	0.40/0.60	0.40/0.60
NE 8949	0.45/0.52	1.00/1.30	0.30/0.40	0.40/0.60	0.40/0.60

non-combatant automotive and aircraft parts. These include steels in the 1300 Series, the principal uses of which are in the making of automotive differential ring gears and pinions; the 2300 Series used in automotive gears, knuckle pins, shafts and collars; the 3100 Series used principally in the manufacture of tractor transmission gears and anti-friction bearings; the 3300 Series, which embraces steels used in the manufacture of aircraft engine piston pins and gears and for heavy truck gears and bearings; the 4100 Series used in the manufacture of automotive differential ring and pinion gears and tractor transmission or differential gears, and the 4300 Series for similar purposes. Grades in the 4800, 5100 and 6100 Series are suited for different types of motor truck and tractor gears, pinions, shafts and pins.

Grades containing 0.30 per cent carbon of the 1300 Series go into the making of automotive axle shafts and shackle bolts; those in the 4100 Series into the manufacture of aircraft sheets, tubing and bars for welding, bolts and scarifier teeth. The 0.30 carbon grades of the 5100 Series are used in the manufacture of automotive side gears and those in the 6100 Series in the manufacture of aircraft propeller blades.

Among the thorough-hardening steels with a carbon content of 0.35 per cent and higher, the alternates worked out for steels suitable for aircraft engine parts, such as propeller shafts, hubs and plates, coil springs, piston pins, knuckle pins, connecting rods and crankshafts (6100 Series) highlight impressively valuable research in the field of conserving nickel, chromium, molybdenum and manganese without materially lessening those properties that are essential in the respective uses to which these steels are put. Marked progress has been made and continues to be made with heat-treatments that lower the consumption of manganese in shell steel, adjustment of sulphur content contributing greatly to insure workability. In fact, compositions of NE steels generally and the work that is now under way to augment the list of alternate steels indicate that more and more of the duties of alloying elements will be taken over by scientifically determined and controlled methods of heat-treating.

In view of the growing importance of the scrap problem and perhaps even more so because of much muddled thinking on this subject, it should be pointed out that the reutilization of alloy steel scrap entails considerations differing from those associated with the various forms of ordinary carbon steel scrap. The supply of alloy steel scrap consists almost entirely of clippings, borings, turnings and what other forms of surplusage result in fabricating operations. Crops or crop ends, which occur in the steel mill when a portion of the ingot is cut off to insure soundness, hardly come under the heading of scrap any longer because mills merely take these "left-overs" and remelt them in their own furnaces. Nor is there any worthwhile tonnage of alloy steel scrap to be looked for from discarded consumers' articles, such as is the case with ordinary iron and steel scrap. Once in a blue moon a junk collector may uncover quantities of some obsolete implement made of alloy steel. On the whole, however, the dependable supply of nickel scrap, nickel steel scrap, nickel chromium scrap, and others comes from the plants of fabricating consumers, be they small machine shops or sizable industrial enterprises. War Production Board orders that such scrap must be properly segregated according to kinds and grades of alloys have been helpful in awakening metal users to their responsibility, but much educational work remains to be done if the flow of alloy steel scrap back into consumption is to be speeded up and kept at a high level. Metallurgists are constantly striving to perfect processes which will increase the yield of alloying elements from scrap.

All that can possibly be done to enlarge the supply of armament steels is being done. Little of it will return as scrap. We will think of that when victory has been attained.

Complete and dismantled propellers serve as demonstration units to supplement the study of sectional drawings. The class is examining a Curtiss electric propeller.

Photos—Courtesy of *Flight* (London)

By
M. W. Bourdon
Special Correspondent of AUTOMOTIVE *and* AVIATION INDUSTRIES in Great Britain

Maintenance of American Aircraft with the R A F

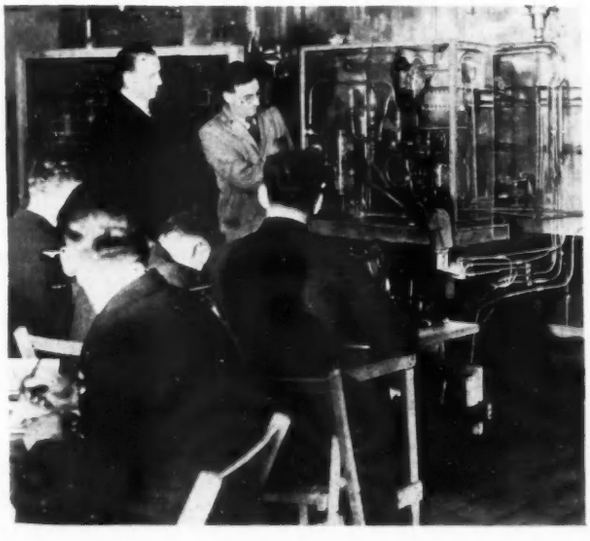
British Establish Separate Organization for Training of Specialists

WITH the arrival in England, some 18 months ago, of American machines in ever-increasing numbers for the Royal Air Force, it was soon disclosed that men trained in the repair and upkeep of British aircraft were constantly at a loss in the dismantling, adjusting, repairing and reassembling of engines and airframes from the United States, owing to the many differences in manufacturing practice and equipment.

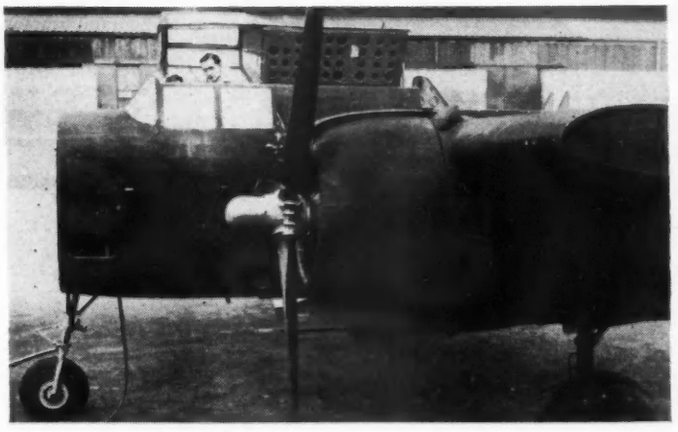
It was decided, therefore, to establish a repair and maintenance depot to specialize in American machines, a depot where, besides attending to current requirements in the upkeep of aircraft already in service, a skeleton staff of expert technicians would act also as instructors at the outset, their pupils to consist of mechanics and others already experienced in the handling of British machines, but lacking in knowledge of the peculiarities of American makes. These early pupils, it was intended, should serve as instructors themselves in due course, thereby enabling an experienced personnel to be increased progressively with increase in the number of American machines operating in England.

A repair and maintenance depot was established, and, with a staff of only 16 men as the nucleus, it has been expanded in size and personnel until now it has some thousands of employes, of whom some 95 per

(*Turn to page* 80, *please*)



Explaining the hydraulic system of the Boston, a twin-engined light bomber built by Douglas.



Partially dismantled planes such as this setup are used for instruction purposes. This view shows a Douglas Havoc, the night fighter version of the Boston, with nose and wing removed.

Curtiss

By Joseph Geschelin

(Left) Ex-Cell-O external thread grinder cutting the large diameter thread on the large nut.

BLADES for the war birds—controllable pitch propellers—are being turned out with ever increasing speed in the group of plants comprising the Curtiss Propeller Division, Curtiss-Wright Corp., whose headquarters plant is at Caldwell, N. J. Here is one of the finest plants of its kind in the country, a modern structure housing some of the most advanced production equipment known to the art. One of the other divisions, located in the Mid-west region has the distinction of being set up for real quantity production, features some items of equipment quite comparable to the best mass-production procedures known in the automotive industry. A distinctive feature of the Curtiss propeller, apart from its unique operating mechanism, is the steel hollow blade, produced by methods developed in the Curtiss plants which differ quite radically from the processes used in other propeller plants.

From the standpoint of production management it is of interest to note the use of the overhead power duct system for the most convenient distribution of power to the machinery. As has been mentioned on other occasions, not only does this make it possible to line up the equipment according to the best layout, but it permits the planning department to shift machinery at will without disturbing power connections.

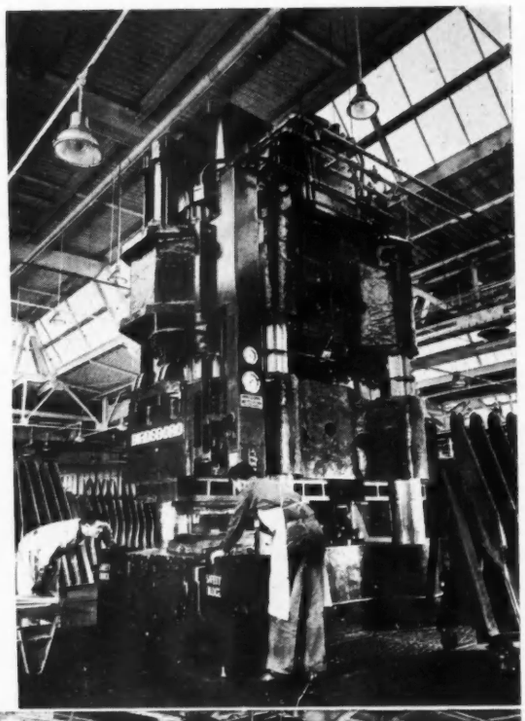
Another outstanding item of production engineering is the use of cemented-carbides for metal removal operations on steel. Most of the turret lathe tools are tipped with steel cutting grades of Carboloy and it is estimated that about 85 per cent of all metal cutting on this plant is done with various grades of cemented-carbides. Apart from the use of the most modern metal cutting equipment known to the art, another evidence of modernity is the use of gravity roller conveyor systems for linking a family of operations. This is most noticeable in the case of the hub group which is traversed by a continuous gravity roller conveyor.

Looking first at the hub machining operations, consider that the hub forging comes in at about 372 lb. and is whittled down to but 56 lb. in the course of the successive metal removal operations. The initial operation is that of drilling and then boring the cross-bore on a heavy-duty, single-spindle, hydraulically-operated Baker drill. The machine is fitted with a rotary table containing two chucking fixtures, thus permitting the loading and unloading of one piece while another is being machined. The forging is first drilled with a 3 5/16 in. drill; then bored with a stepped cutter to produce the rough-boring, rough-facing, and step-boring stages.

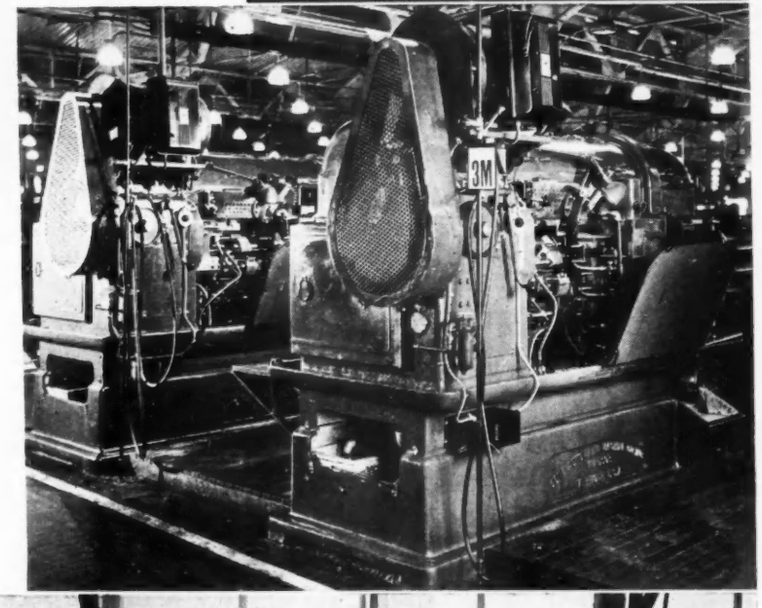
The work then is routed to the battery of 6-D Potter & Johnston heavy duty automatic chucking turret lathes for rough- and finish-boring the cross-bore and rough-boring of a conical seat. The extension end is turned by an overhanging tool on the turret, faced by tools on the cross-slide. One machine handles one side of the forging, the other performs the same operations on the opposite side. Both machines are fitted with Carboloy tools for internal cuts; and Stellite J-metal for external cuts. A two-spindle Cincinnati Hydro-Tel machine is employed for removing the excess stock on the outside of the hub contour and finishing to the required form between the barrels.

After heat-treatment and Magnaflux inspection, the

Propellers

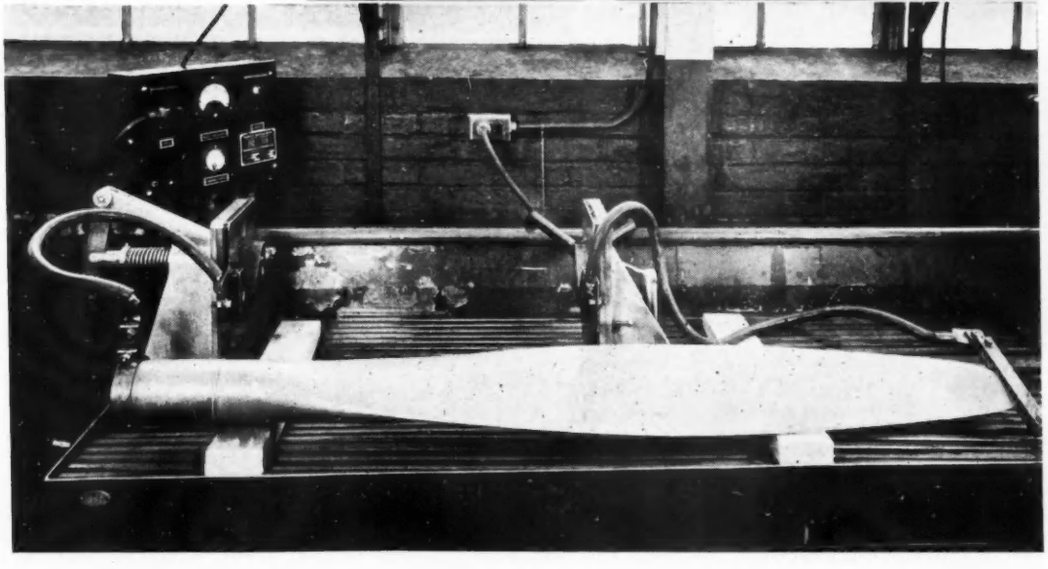


(Top right) One of a battery of giant Birdsboro presses employed in the fabrication of Curtiss propellers, this is a 2000-ton unit used in the formation of the hollow steel blades.



(Center above) Shank ends of the blade are heated in this two-station Tocco induction heating machine, preparatory to upsetting in the huge National forging machines.

(Right) Two of the big Conomatics are found on the line serving the governor section of the plant.



(Right) Magnaflux inspection of a blade, one of the most exacting control operations in this plant.

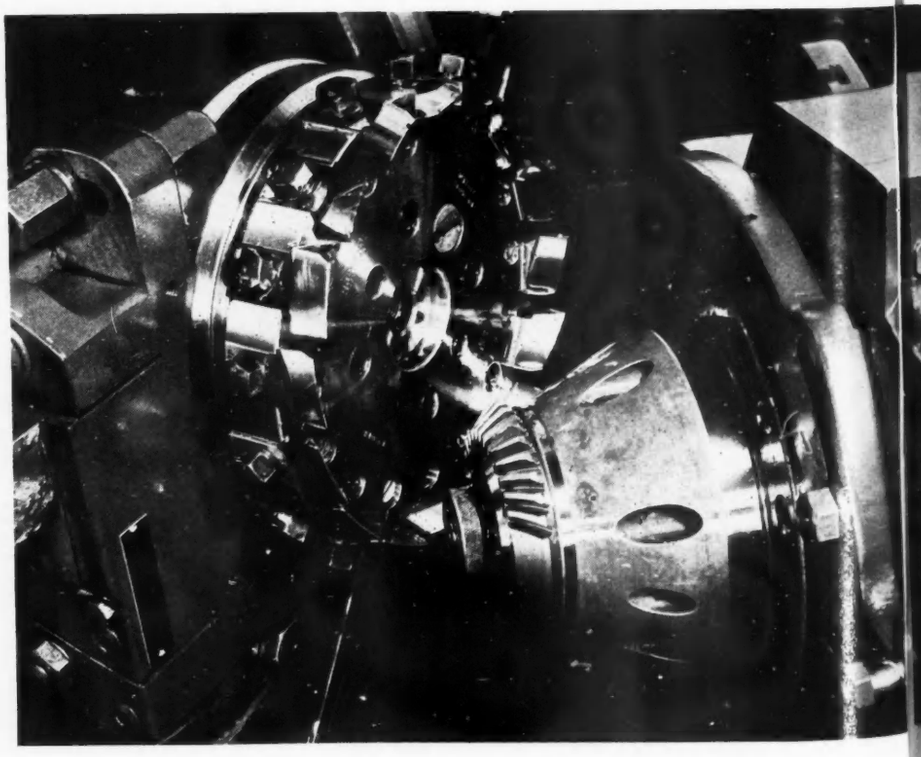
Precision grinding of small elements of the governor assembly is done on Landis hydraulic grinders such as this one.

hubs go to a large horizontal LaPointe hole broaching machine for broaching of the spline through the cross-bore, employing broaches 66 in. in length. For the final finishing operations, the hub goes over a battery of the massive Bryant chucking grinders to finish the cross and barrel bores, conical seats, etc.

Doubtless the most dramatic operations are concerned with the fabrication of the hollow steel blades. The process starts with thick plates of chromium-vanadium alloy steel of the proper thickness and size for the thrust and camber sides of the blade. Each plate is inspected for size and subjected to metallurgical examination before machining and is suitably stamped with an identification indicating the heat number and serial number. Next follow a succession of milling operations in a large department equipped with huge Cincinnati Hydromatic mills. The plates are first milled along the edges to produce the desired width and angularity for clamping in subsequent operations. Then the plates pass on to other Hydromatics for slab-milling of one side. From this point on the camber and thrust plates take different paths.

The camber plate is milled again and routed to a 3000-ton Birdsboro hydraulic press in which the length-wise edges are bent downward to start forming the camber. This is followed by another milling operation. Camber plates return to the large press for blanking, followed by complete formation of the plate including the shaping and closing of the cylindrical shank end. Operations on the thrust plate are much simpler since these plates do not require the preliminary work on the presses. Blanking and forming of the thrust plate are done on the large Birdsboro press.

Finally, the camber and thrust plate are welded together by a special procedure while the two plates are held clamped in a special fixture. Then follow numerous preparatory steps, making the blade ready for the final formation of the shank end. Here we have a battery of two large National upsetters served by a single, two-station Tocco induction heating machine recently installed. The shank end is inserted in a suitable fixture in the Tocco machine where it is heated quickly to the required temperature and then goes



One of the most interesting operations is the cutting of the helical bevel gear end on the split gear member. This is done on a new type Gleason generator, using the circular cutter shown here.

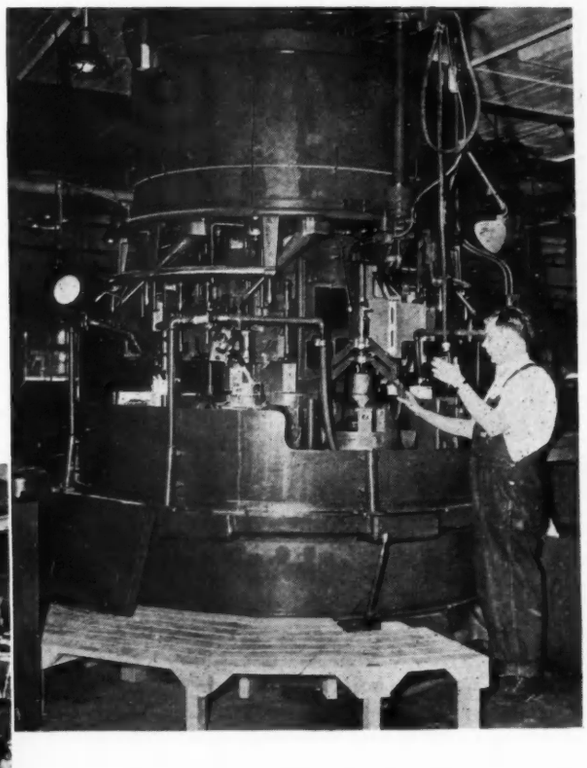
through the forging dies for upsetting and formation of the end section. The blade fabrication process includes several shot blasting operations, hot-straightening, rough turning, normalizing, etc.

Balancing of each blade is an exacting procedure, facilitated by the development of an ingenious but simple balancing machine. The operation is done on a special stand. Here the shank end is inserted into a holder having a weighted bar on the opposite end, serving the function of a dummy blade. The balancing operation establishes the true center of the blade in the two principal axes.

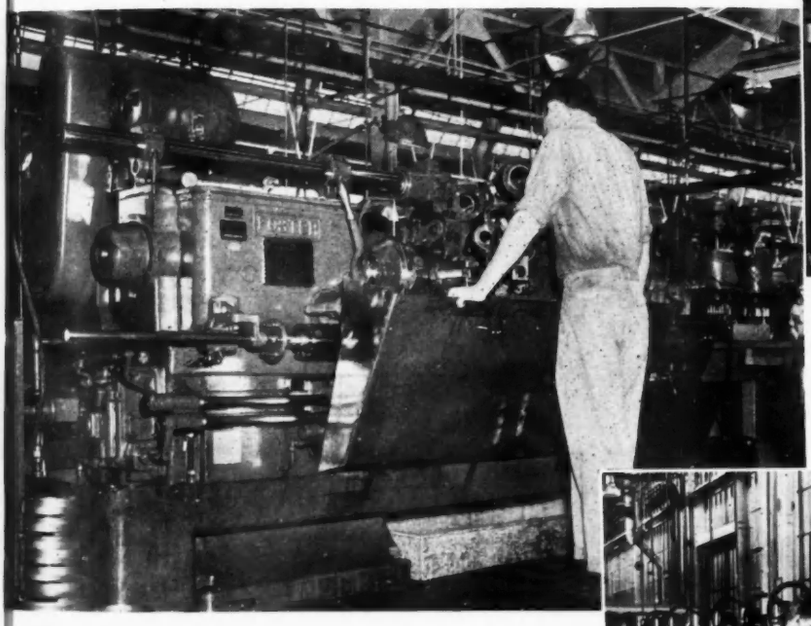
Immediately following the welding operation mentioned earlier, the blade is subjected to a Magnaflux test to assure freedom from cracks or surface imperfections. Following preliminary balancing, the blades are finished all over by snagging and polishing, then plated with a protective coating. A final balancing operation is performed thereafter to assure perfection before the blade is fitted in the hub.

A large battery of Foster Fastermatics is found in the nut machining department. The crankshaft nut is made of Ampco bronze analysis metal, cut with Carboloy tools. The large steel nut also is made in this part of the plant, using other Fastermatic turret lathes and cutting Carboloy-tipped tools. Here will be found Heald internal grinders, and an Ex-Cell-O precision thread grinder.

One of the interesting wrinkles in the machine shop



(Above) Eight boring and facing operations on the hub are performed in one setting on this Bullard Mult-Au-Matic, one of a battery of Bullards in another of Curtiss-Wright plants.



(Above) Here is a close-up of one of a battery of Foster Fastermatics in the Curtiss-Wright plant. These machines are used primarily on the production of large steel and Ampco-metal nuts.

(Right) Tiny gears for the governor assembly are cut on this battery of Fellows High-Speed gear shapers.

A Heald internal gear grinder finishing the bore of one of the large nuts.

made in two halves from two separate forgings and yet must be perfectly true as to machining and alignment of the hub and the bevel gear sections. The first operation is that of grinding of the mating faces of the forgings, making it possible to match the forgings in pairs in special chucks. The next operation, on a milling machine, produces several locating spots for guiding succeeding stages of machining.

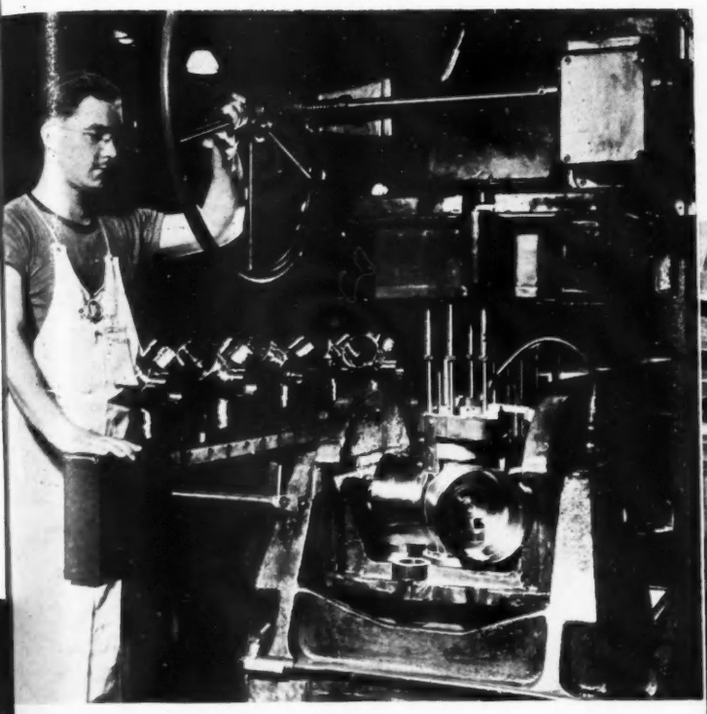
The split gear, while held in a special pot chuck, then proceeds

is the use of permanent magnetic chucks for holding steel parts during various surface grinding operations to prevent the distortion and the marring of surfaces that may occur with the use of conventional holding devices.

Perhaps one of the most difficult parts to be handled in any machine shop is the large split gear which is

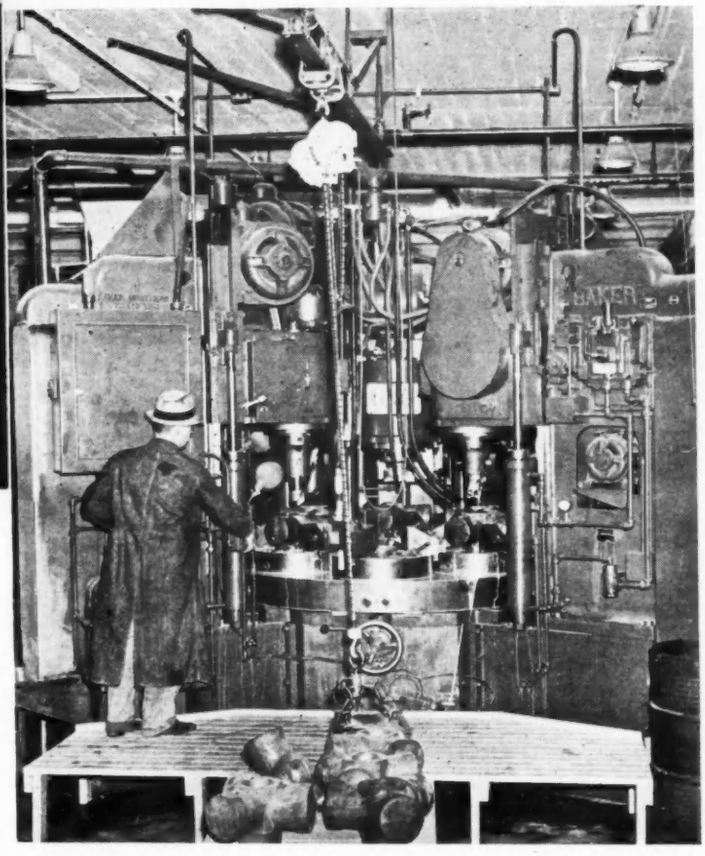
(Above) On the governor line, one of two Gorton profiling machines, used for contouring the inner portions of the governor case.

(Left) Close-up of one of the units in a huge battery of Cincinnati Hydromatics in this plant. Shown here is a slab-milling operation, tapering the plate for a blade member.



(Left) Hubs are drilled in Natco multiple-spindle drill presses, such as the one shown here.

(Below) Latest development is this vertical five-station Baker drilling machine. It handles the preliminary drilling of five hubs at a time.



through various stages of turning and boring operations, grinding, gear cutting, etc. There is one set-up on a large Cincinnati Hydromatic in which the end sections of the gear portion are beveled off. This grinder has a multiple fixture holding three half sections at one time. It is of interest to find that the previously ground mating surfaces of the split halves are lapped on a rotating surface plate a number of times during the course of the machining stages. In each instance the work is removed from the holding chuck, lapped and fitted together. Of the many grinding operations, one on a Cincinnati surface grinder is outstanding. Here the entire outer surface of the assembly is finish-ground right up to a square shoulder at the bevel gear ring, using a plunge cut.

The gear end of the split gear is cut on Gleason machines. The helical bevel type gear is cut on the new type Gleason generator, using a circular cutter which rough- and semi-finish cuts the gear teeth in one operation. The gear teeth are finished in a new Gleason grinder. The straight bevel gears on other models are cut on the conventional two-tool Gleason generators.

Another interesting department is one in which the governor assembly is produced. Here is found a line of Fosdick multiple drills and other types of sensitive drilling equipment for the governor case. Too, there is a battery of two Gorton profiling machines for contouring the inner portions of the governor case. Two huge Conomatics of 8-spindle type are employed for the making of many of the small screw machine parts that are used in the governor assembly. This department also features a battery of the new High Speed Fellows gear shapers for cutting tiny gears, particularly the small gear section on the end of the governor spindle. Several of the latest type Landis hydraulic grinders are used for the grinding of various small parts comprising the governor assembly.

The speed reducer housing, an aluminum casting, is machined in another of the many departments found in this plant. A feature of this line is a battery of versatile Heald Bore-Matics used for finishing the bores. These machines are provided with Carboloy-tipped fly cutters.

The foregoing is intended to be only an outline of some of the high spots of one of the important operations essential to the war program. The pictorial treatment gives a better perspective of certain operations.

THE exhaust temperature is generally considered an important operating characteristic in the case of diesel engines. Temperatures of exhausts from supercharged engines run no higher than those of exhaust engines with atmospheric induction. The explanation of the seeming discrepancy is to be found in the fact that in supercharged four-stroke engines there usually is a large overlap of inlet and exhaust periods, and a considerable fraction of the air delivered by the blower passes right through the engine and escapes with the exhaust, lowering its temperature.

New

SINCE the article on Rubber Substitutes appeared in these pages (in the June 15 issue), a number of new developments, which have affected the general situation, have come into prominence. The most important among these undoubtedly are the announcements that Thiokol rubber substitute, to be produced by the Dow Chemical Company, may be available for retreads; that the Standard Oil Company (New Jersey) has so improved its Butyl process that it will be possible to get greatly increased production from a given equipment; that Standard Oil also has a new rubber substitute of the Butyl type, known as Flexon, and Houdry has developed a process for making butadiene directly from butane.

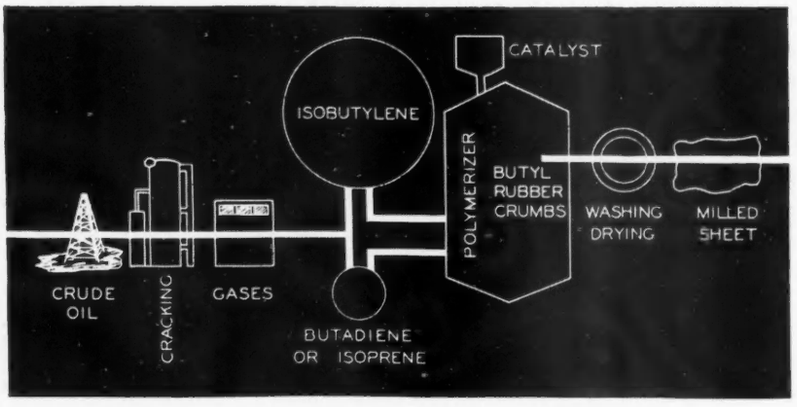
Thiokol

Thiokol was in reality the first rubber-like synthetic substance to be produced in this country, its discovery dating back to the early twenties. It is an interesting example of how important inventions sometimes are made in a more or less accidental way, that its inventor, J. C. Patrick of Kansas City, was looking for a better anti-freeze for automobile radiators when he brought about the chemical reaction that yielded the rubber-like substance now known as Thiokol. In the past this synthetic material has been used chiefly where its resistance to attack by petroleum derivatives is of value, as in the rubber hose of fuel pumps at filling stations. It is used also for sheathing underground cables, in which application it replaces lead, and for printing plates which serve in place of metallic electrotypes. As used for these applications Thiokol is not a polymer in the usual sense, but a chemical compound resulting from a reaction between sodium polysulfide and ethylene dichloride. A long-chain type of molecule is believed to be formed by this reaction, and sodium chloride (table salt) drops out.

Up to recently Thiokol was not considered suitable for use in tires, and it was not included in the Government's program for meeting the rubber-shortage situation. It will be remembered that in our previous article only Buna S, Neoprene and Butyl rubber were dealt with. However, the physical properties of a rubberlike substance can be altered greatly by suitable compounding and processing, and it appears that ways and means have been found recently of rendering Thiokol suitable for retreads. It is to be produced for the purpose by the Dow Chemical Company, which has been licensed by the Thiokol Corporation, and a pilot plant was placed in operation in mid-July. The lessons learned from this pilot plant will be made use of in the erection and equipment of full-scale plants that are expected to furnish enough material for recapping or retreading from 12 to 18 per cent of the tires now in service on passenger cars. This plan has been promulgated by the Rubber Manufacturers Association, which figures that to produce for civilian use, during the two-year period July 1, 1942, to June 30, 1944, 13,223,000 new tires and 30,291,000 recaps would require 3332 tons of new rubber, 97,420 tons of reclaim rubber, 33,188 tons of Thiokol, and 32,475 tons of Butyl.

Thiokol production is not a new venture for the Dow Chemical Company, as it has been making the

Butyl Flow Chart



Developments in the Rubber Situation

material for industrial purposes since 1938. For retreads a new formula, known as Thiokol N, is to be used, and it is only natural that in the production of this new grade some new problems should have arisen that call for solution. Tire manufacturers are said to be now convinced that Thiokol is suitable for retreads.

No definite figure for the yearly production capacity of the contemplated Thiokol plants has yet been agreed upon, but a minimum of 80 million and a maximum of 120 million pounds have been mentioned. It takes about 5 lb. of rubber or substitute to retread a tire, hence production on the contemplated scale would permit of retreading from 16 to 24 million tires. There has been some talk of making retreads thinner during the emergency, and if that plan should be adopted, the number of tires which could be retreaded would be correspondingly increased.

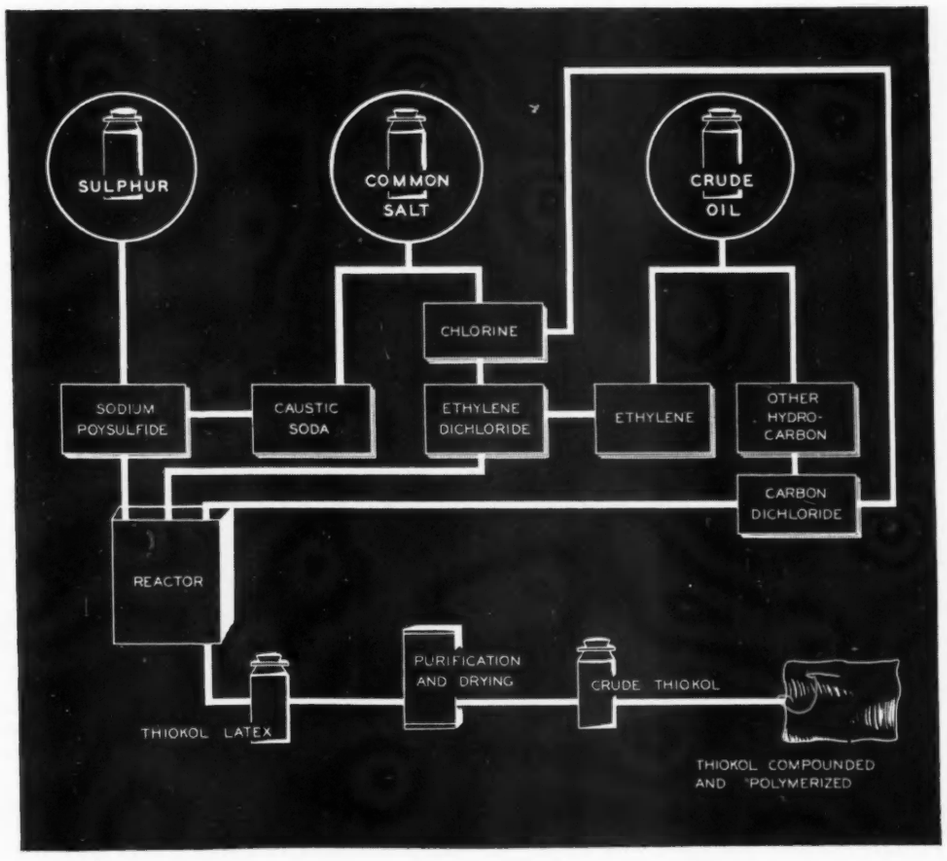
One of the flow diagrams reproduced herewith illustrates the production process for Thiokol N. These "Flow Charts," by the way, were exhibited at Washington, D. C., recently by the Rubber Manufacturers Association, chiefly for the benefit of government officials who have to wrestle with the problem created by the cutting off of the supply of natural rubber.

The raw materials used in making Thiokol are caustic soda (lye), which is obtained from wells in Michigan, sulfur (of which large quantities are obtainable from Texas and Louisiana), and petroleum derivatives. However, instead of the petroleum derivative ethylene, grain alcohol could be used.

In making Thiokol, sulfur, ethylene, dichloride and lye in an acqueous solution are charged into a large reactor. A clay-colored liquid is thus obtained, and when acid is added, rubber-like pellets appear. These pellets are dried, which gives them a sponge-like appearance, and are then compressed into slabs, in which form they are shipped to the rubber-processing or tire factories.

Crude Thiokol is the product of what is known as a condensation process. No polymerization is involved. It will be seen from the Flow Chart, however, that the last step in the production of Thiokol for retreads is one of compounding and polymerization. It is understood that the chemical reaction alone gives long-chain molecules consisting of sulfur, carbon and hydrogen, but evidently it has been found that by subjecting this compound to heat and pressure, a further linking up of molecules can be achieved and the mechanical prop-

Thiokol N Flow Chart

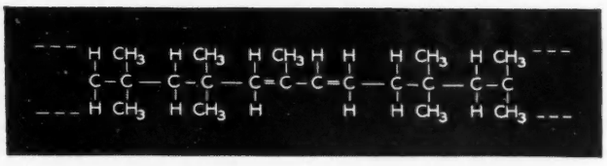


erties of the product improved. It is not claimed that Thiokol is equal to virgin natural rubber as a tread material, but retreads of the product are expected to give an additional tire life of some 5000 miles, provided speeds of 40 mph are not exceeded.

Butyl

It has been announced that as a result of improvements in the process of producing Butyl rubber substitute, the War Production Board has increased the quota of Butyl for 1943 from 60,000 to 132,000 tons. This makes the total scheduled production of rubber substitutes for 1943, at this writing, 870,000 instead of 800,000 tons.

Molecular Diagram of isobutylene-isoprene polymer



The improvement in the Butyl process resulted from the discovery that when a small quantity of carbon black is added to the feed stock, it acts as an accelerator and speeds up the polymerization process. Not nearly as many recyclings are then required, and much more rubber can be produced with a given equipment in a given time. This improvement in the process is expected to reduce the plant investment required per ton of annual capacity from $750 to $350, and to lower the cost of production by about 5 cents per pound of Butyl.

In a statement issued by President W. S. Farish of Standard Oil Company (New Jersey), it is brought out that the improvement in the Butyl process raised the capacity of the five plants under construction for the Government by the Standard Oil Company of Louisiana and the Humble Oil and Refining Company from 60,000 to 192,000 tons per year at an estimated additional investment of 27 per cent. At the request of the War Production Board it was decided not to proceed with one of the plants and to use the money and material thus saved in increasing the capacity of the remaining four from 60,000 to 132,000 tons per year. At the same time it was decided to increase the isobutylene-recovery capacity from 60,000 to 90,000 tons per year. Isobutylene is a common refinery by-product, and it is believed that the additional 42,000 tons required for the increased Butyl production can be obtained from plants located in the vicinity of the new Butyl plants, and will not necessitate any additional investment by the Government.

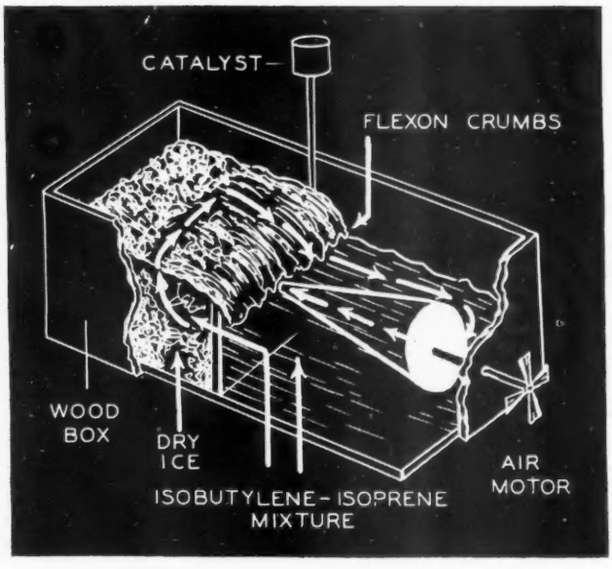
Plants for producing Butyl rubber are going up rapidly, and one, with a capacity of 6666 tons per year, is expected to go into production in December next. By the middle of 1943 the total Butyl-production capacity is expected to reach the rate of 132,000 tons per year.

As shown in the accompanying flow diagram, Butyl rubber is made from isobutylene, $CH_2{:}C(CH_3)CH_3$, a hydrocarbon gas derived from the gaseous products of the cracking still, and either butadiene, $CH_2{:}CHCH{:}CH_2$, which, as explained in the previous article, can be produced either from distillery gases or from grain alcohol; or isoprene, $CH_2{:}CHC{:}(CH_3){:}CH_2$, the mother substance of natural rubber, which can be produced synthetically from coal-tar products. Butyl rubber, therefore, is a co-polymer of either isobutylene and butadiene or isobutylene and isoprene. It has been found that the isobutylene-isoprene co-polymer has the more desirable properties, and at present Butyl rubber is made of isobutylene and isoprene, about 3 per cent isoprene being used. A diagram of part of the long-chain isobutylene-isoprene molecule is shown herewith.

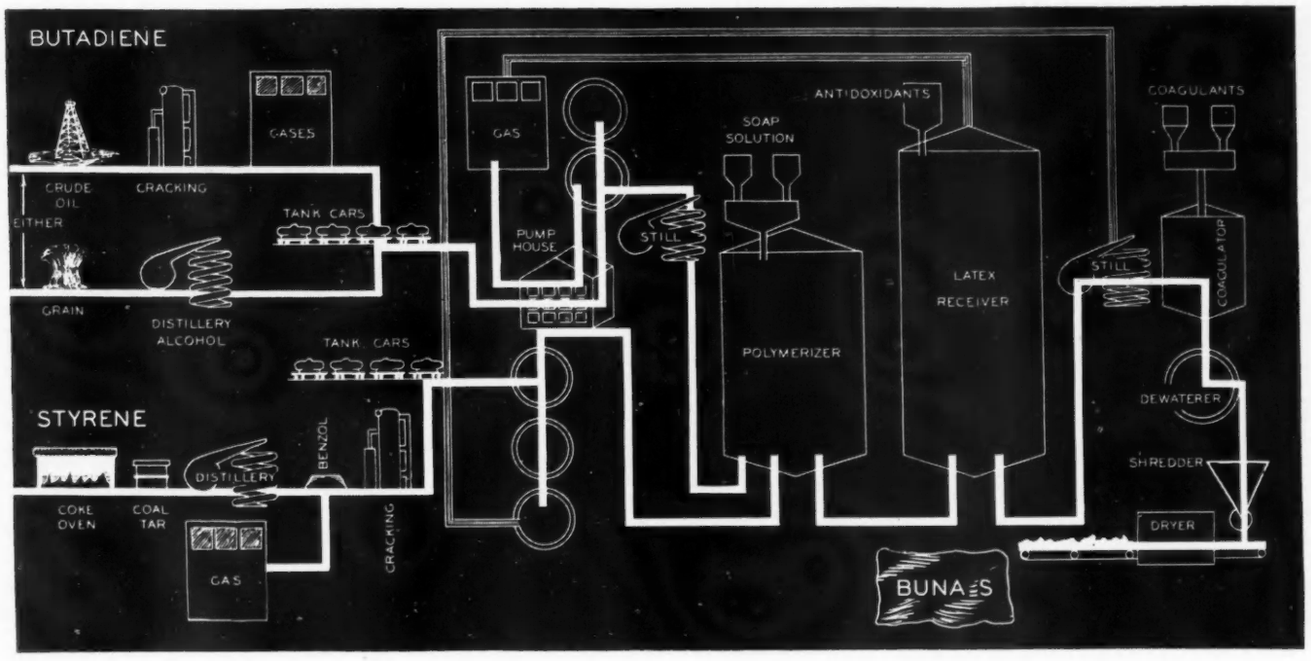
Flexon

Isobutylene has a boiling point of 21 F and at normal atmospheric temperatures it is a colorless gas. To polymerize it and convert it into a solid it must be cooled. In the Butyl process polymerization is carried on at minus 153 F. The new rubber substitute known as Flexon, recently announced by the Standard Oil Company (New Jersey), is made from the same raw materials and intermediates as Butyl, and it differs from the latter only because the polymerization process is carried out at a temperature not quite as low. The reason for operating at this temperature (minus 103 F) is that is permits the use of makeshift equipment for the polymerization and obviates the need for critical materials, chiefly steel and compressor equipment. As shown in the diagram, the process is carried out in a large wooden box. A low partition divides the interior of the box into two compartments,

Flexon Production Process



Buna S Flow Chart



one of which is partly filled with solidified carbon dioxide (dry ice). The isobutylene and isoprene mixture is introduced into the other compartment, and it is forced through and over the dry ice by means of an agitator. In the dry-ice compartment it comes in contact with a catalyst. Thus the gases are cooled and liquefied, and they are then partly converted into Flexon crumbs, which are later processed in the same way as rubber and other rubber substitutes.

As to the qualities of Flexon, it is said to be inferior to Butyl but better than reclaimed rubber. The writer takes this to mean that when Flexon is substituted for reclaimed rubber in retread stock, it will give greater additional tire life. It seems that the chain molecules formed by polymerization are the longer the lower the temperature of operation, which explains why Flexon is not equal to Butyl.

A small plant for the production of Flexon is under construction and is expected to be ready for operation in September. It will have a capacity of four tons a day at the start, which will later be increased to eight tons per day. Flexon does not yet figure in the Government's program for the relief of the rubber shortage, but we understand that a number of other refiners have expressed an interest in it.

Butadiene from Butane

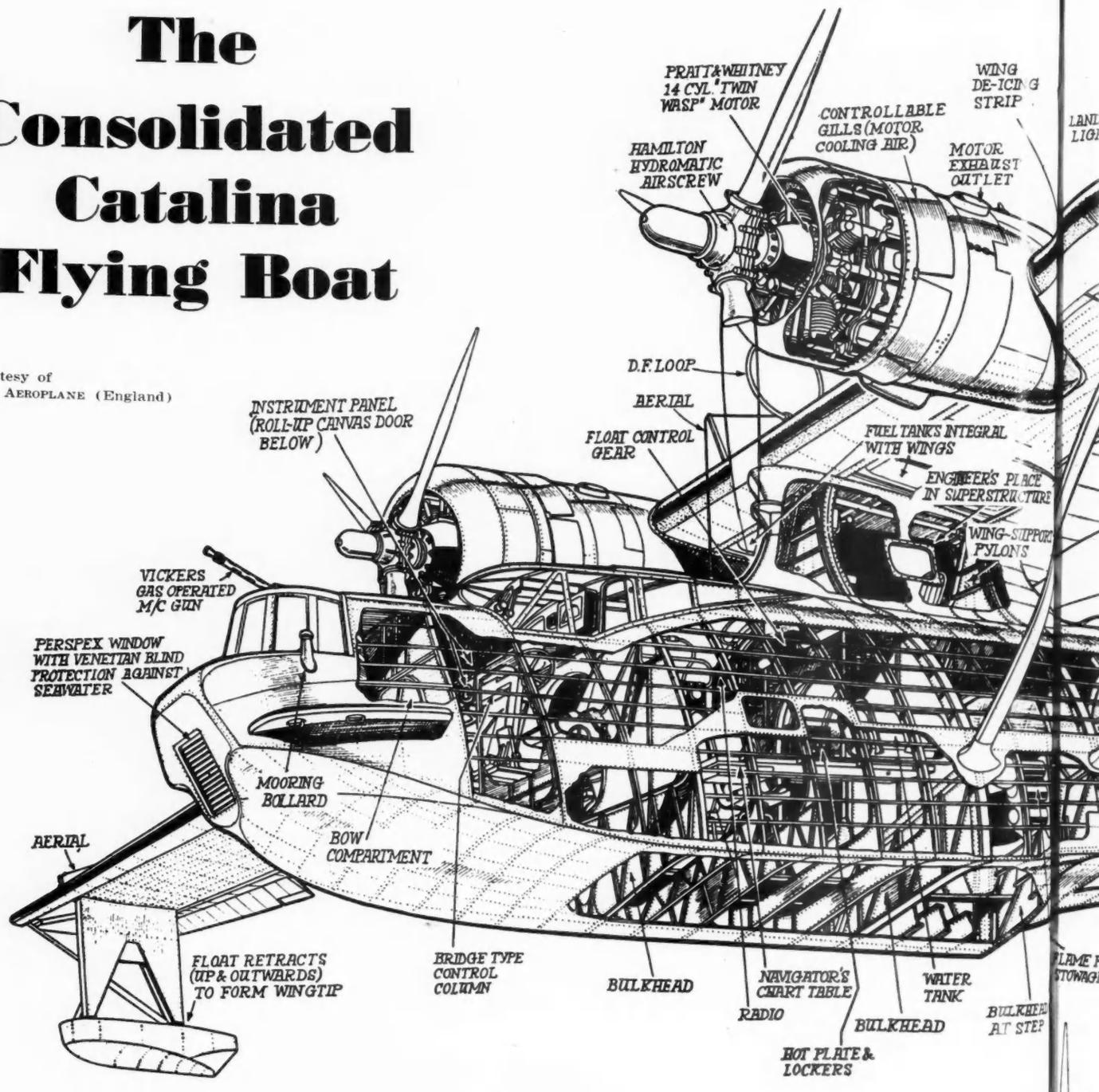
By far the largest part of the synthetic rubber to be produced under the Government's program for 1943 is Buna S, the chief intermediate for which is butadiene. This butadiene is to be produced from butylene, a constituent of the gaseous by-products of the cracking still, and a plant for the recovery of butylene for the purpose is now under construction at Borger, Tex., and is to be operated by the Phillips Petroleum Company.

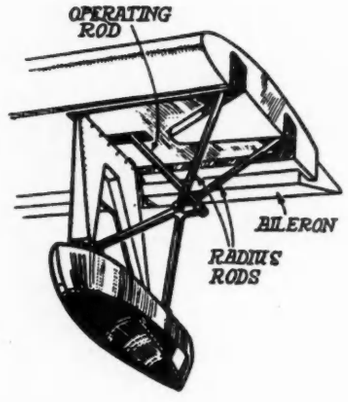
In the meantime Eugene J. Houdry, inventor of the Houdry process for the production of high-octane gasoline, has come forward with an alternate process for the production of butadiene, starting with butane, a hydrocarbon of the paraffin series, which also is a constituent of refinery gas. Butane has the chemical formula C_4H_{10}, while that of butadiene is C_4H_6, and the process of converting butane into butadiene, therefore, is essentially one of dehydrogenation. A catalyst of the chromium type is used. The dehydrogenation takes place at 1050 F, and in the pilot plant the gases are raised to this temperature in two stages. They are first heated to 850 F in a salt bath and then to 1050 F in a lead bath. After the butadiene is removed from the reactor it is cooled to liquefy it, and it is then subjected to a purifying process.

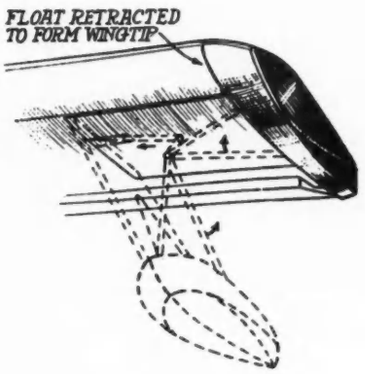
Mr. Houdry claims that his process of producing butadiene from refinery gases is materially simpler than that which has been selected for the Neches Butane Products Company process in Texas, which is to be operated jointly by Socony-Vacuum, Gulf, Atlantic Refining, Pure Oil and Texaco. He says it involves only two distinct steps, as compared to five in the case of the Neches process, which latter also calls for much new equipment requiring the use of strategic materials such as high-grade steel and compressor equipment. So far, however, he has not received much encouragement from the Rubber Reserve Co., which contends the process is insufficiently developed to warrant its adoption at this time. On the other hand, engineers of the Phillips Petroleum Company have made an investigation of the process and have reported on it to the Rubber Reserve Co. Standard of California, Sun, Socony-Vacuum and other oil companies also have investigated and approved the process. (*Turn to page 74, please*)

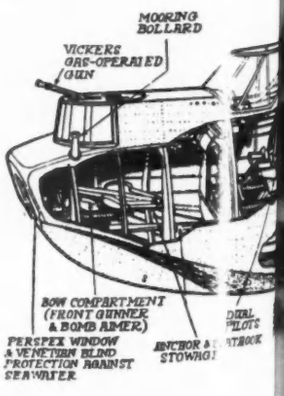
The Consolidated Catalina Flying Boat

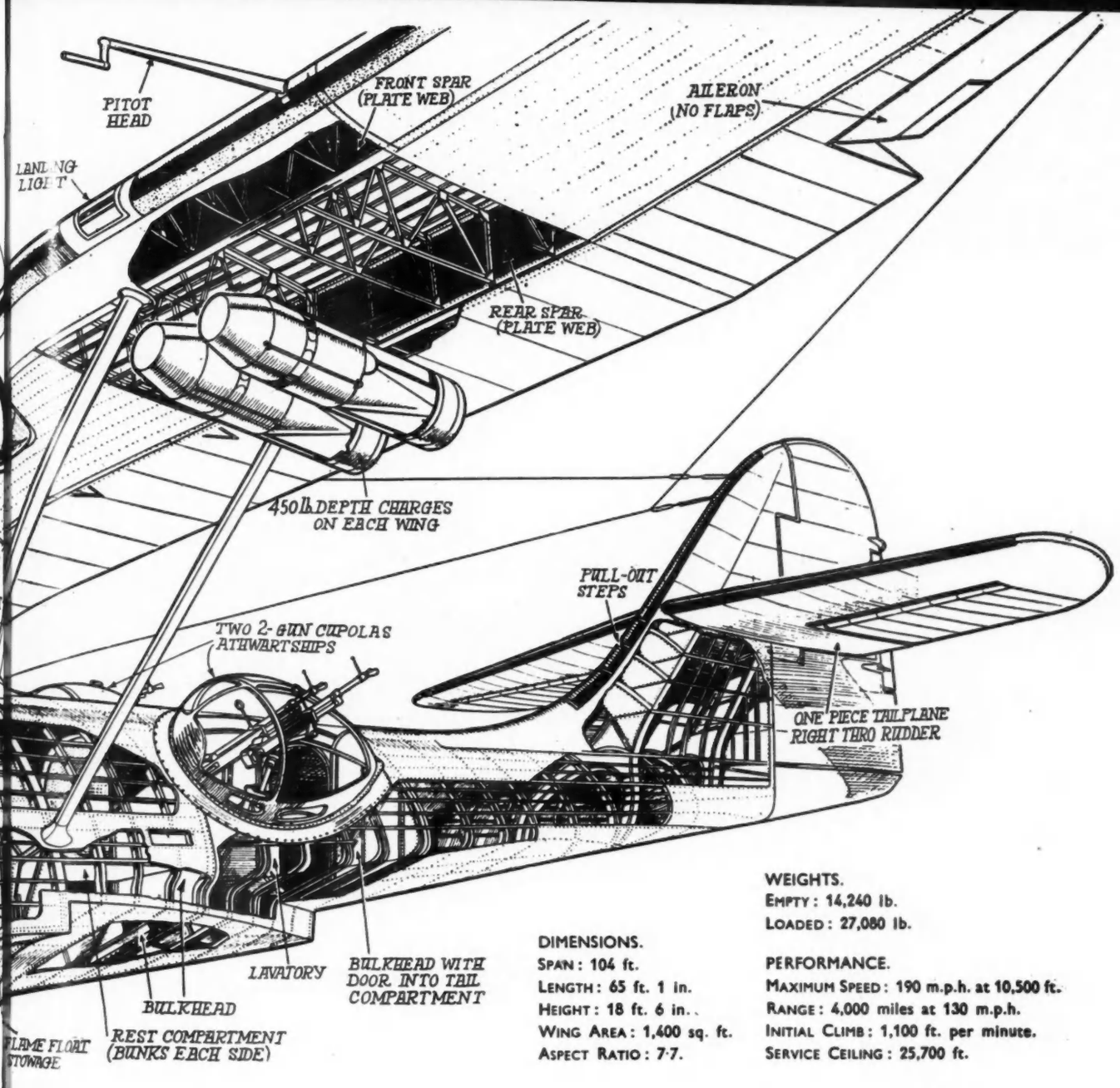
Courtesy of
THE AEROPLANE (England)







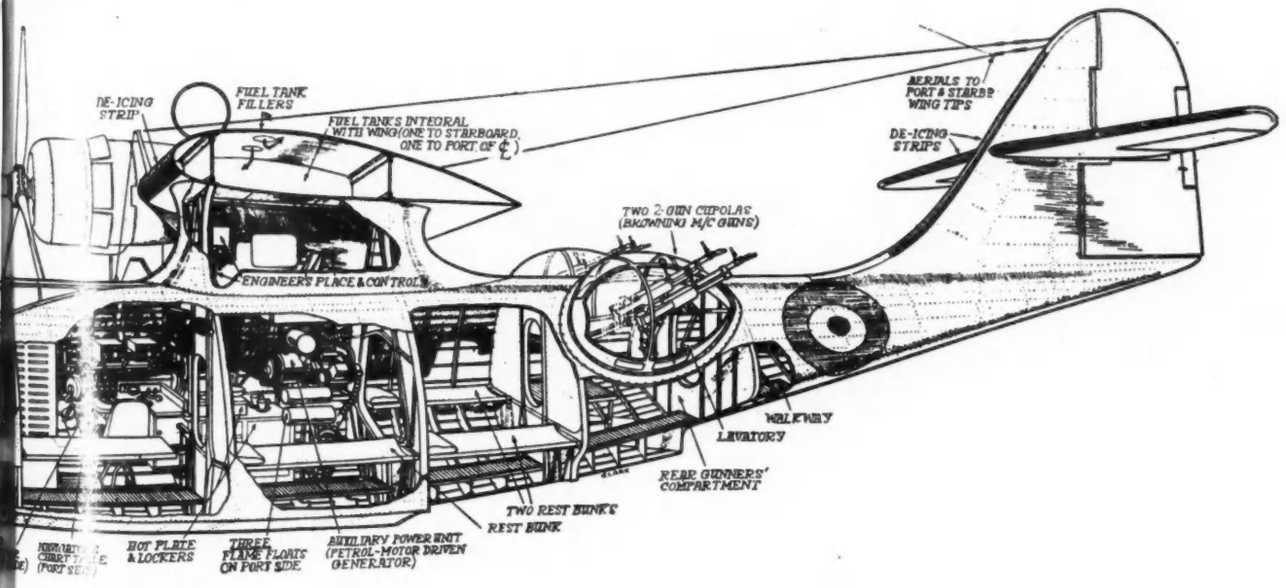




DIMENSIONS.
SPAN: 104 ft.
LENGTH: 65 ft. 1 in.
HEIGHT: 18 ft. 6 in..
WING AREA: 1,400 sq. ft.
ASPECT RATIO: 7·7.

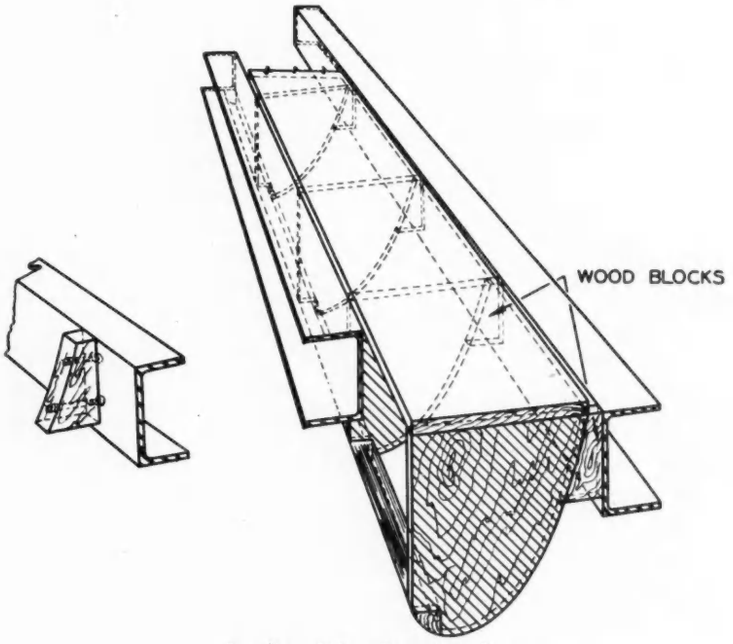
WEIGHTS.
EMPTY: 14,240 lb.
LOADED: 27,080 lb.

PERFORMANCE.
MAXIMUM SPEED: 190 m.p.h. at 10,500 ft.
RANGE: 4,000 miles at 130 m.p.h.
INITIAL CLIMB: 1,100 ft. per minute.
SERVICE CEILING: 25,700 ft.



Tooling for

By William D. Lewis*
Timm Aircraft Corp.



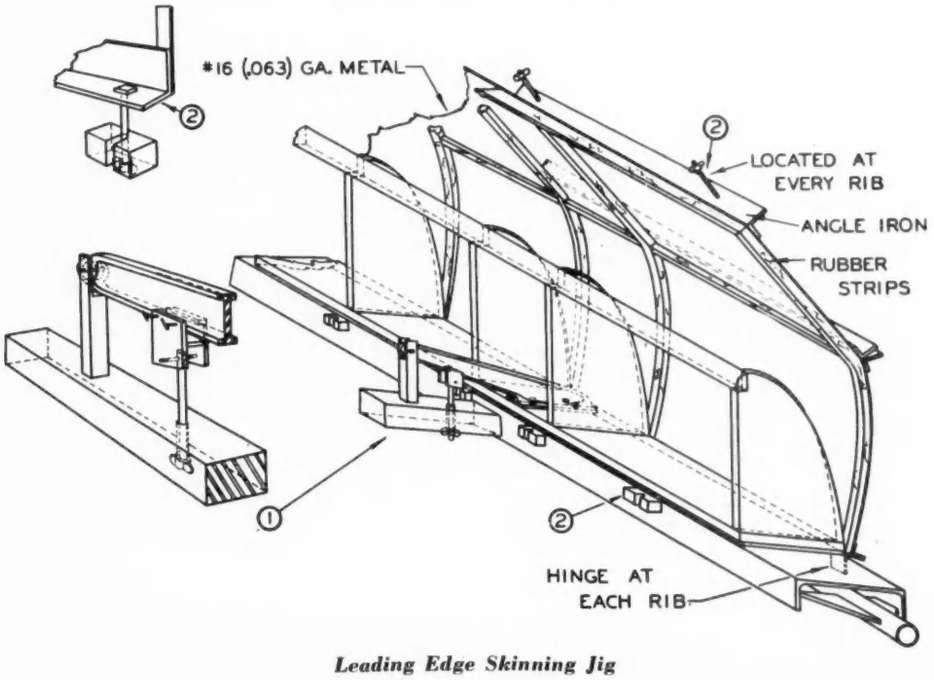
Leading Edge Forming Jig

AIRCRAFT production in the United States is being hampered at present by three factors, these being a shortage of strategic materials, a shortage of metal-working machinery and plant capacity, and a shortage of skilled metal workers. If wood could be used extensively as a material of construction, all three of these bottlenecks could be eliminated immediately and our present aircraft-production facilities nearly doubled, by entrusting the furniture and allied woodworking industries with the fabrication of parts, under the supervision of established aircraft manufacturers. No new buildings would have to be erected, no new metal-working machinery acquired, and there would be no need for time-consuming training courses for employees.

It has been the general impression that building aircraft of plastic-bonded plywood involved unique principles, but the fact is that there are many points of similarity between the processes employed in the production of plastic-bonded-plywood and all-metal planes. In both processes it is necessary to make allowance for expansion, contraction, and variations in thickness. In wood construction it is necessary, in addition, to keep close tab on dimensional errors, as these build up in the assembling process.

Wing Construction

Let us take the wing and its component parts as an example. The laminated spar caps may be formed with whatever type of press is available, and even by means of simple C clamps. When clamping the laminations to the pattern, heed needs to be paid only to the inside surface, not the surface tangent to the skin. With the inside surfaces of both upper and lower spar cap formed to the correct contour, these two members are placed in the assembling jig, so that the verticals, filler blocks, etc., can be installed. Following this procedure, the smaller parts can be cut net with miter boxes and assembled to the caps with very little difficulty. After all of the parts —verticals, filler blocks, etc.—are assembled, the spar can be run through the planer to finish the forward and aft surfaces. Finally, the spar is contoured to



Leading Edge Skinning Jig

* Abstract of paper presented at an SAE meeting in Los Angeles, Calif., on June 5.

Plastic-Bonded Aircraft

the proper foil section by a sawing device. By this process it is possible to cut down the fabrication time for spar caps and spars considerably. The assembly having been completely formed, the holes for all attaching fittings may now be drilled, provided, however, that from this point on the moisture content of the assembly is controlled.

Tooling problems are greatly reduced by the above procedure, for it has been necessary only to confine two working surfaces. The first-stage assembly fixtures are comparatively simple, consisting merely of a table with collapsible space blocks which ensure the proper spread of the caps. This latter is quite an important factor, since the spar should remain on this fixture long enough to allow the resinous substance to set fully. Since the assembly must remain in the fixture for quite some time, the cost of the latter should be kept down to a minimum. As one drill jig can handle a considerable production volume, this procedure works very well in most cases.

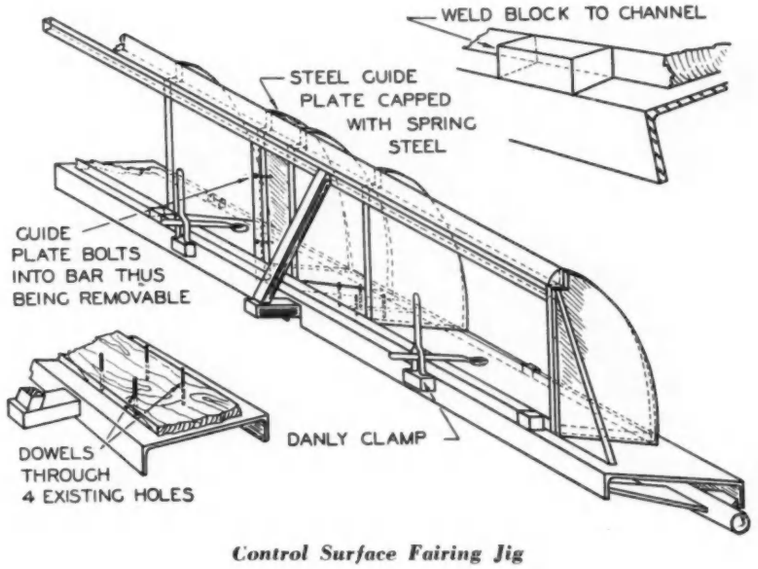
The design of the drill jig depends to a large extent on the thickness of the spar, as in a very thick spar the drill is apt to run out. With spars of box type it is usually considered advisable to turn the spar on edge and drill it in the vertical position, which makes it possible to drill from both sides.

Assembling of the leading edge ribs, etc., to the main spar may be accomplished in substantially the same manner as in all-steel wings. That is, the ribs are attached to the spar and then skinned. Here again the tooling required is comparatively simple, since the location of the spar on the jig is determined by holes drilled in the spar drill jig. The tool consists merely of a table, usually made of channel iron and finished on top, with pins to receive the part, and adequate removable locators to locate the ribs.

This procedure for assembling the leading edge is applicable only if the ribs have been carefully fabricated and rigidly inspected for both contour and the proper bevel. This inspection requires a checking fixture for each rib, although the ribs can be readily fabricated with cerromatrix or cerrobend.

If the ribs are not fabricated to a perfect contour and bevel, provisions must be made in the leading edge assembly jig to fair them in relation to each other. Three or four steel plates with hardened edges, carefully contoured and beveled, will serve as master ribs to fair to with a common fairing stick, which is merely a straight edge with sand paper secured to its face. The number of master blocks required depends on the size of the wing. The master stations allow pressure to be applied wherever they are located, making it unnecessary to keep the fairing board straight. A workman will keep on with the sanding operation until his straight edge hits these stops. This operation takes only a short time and often is preferred to methods designed to ensure the utmost degree of accuracy in the fabrication of the ribs, since errors will accumulate in the assembling operation.

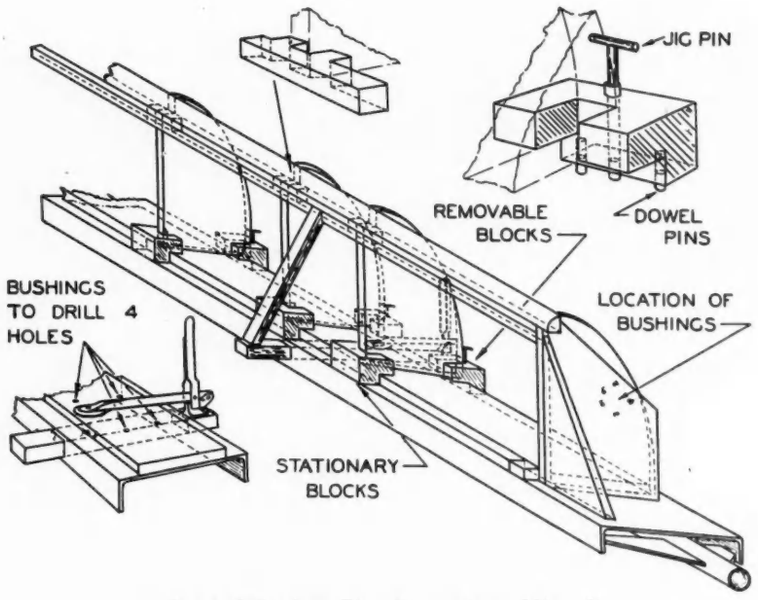
Several different mechanical sanding bars have been produced, of the type mentioned in connection with the fairing of ribs, but in the experience of a number of companies these mechanical contrivances have not been successful; at least they have not displaced the old method of hand sanding.



Control Surface Fairing Jig

After the ribs have been faired, the skinning operation can be performed on this jig by removing the master plates (which are hinged) and other interfering parts, and using nailing strips to attach the skin. If the scale of production warrants it, an additional jig may be provided for skinning the leading edge only. This will consist of a flat table with pins on it to enter the holes, and rubber-faced strips to exert pressure where required. If this operation is performed by means of jigs, rather than nailing strips, several jigs will be required, since the assembly must remain in the jig long enough for the resin to set.

If production is on a sufficiently large scale to warrant sub assembly for the trailing edge, it may be accomplished in much the same manner as in the case of the leading edge. Some variations in the method



Control Surface First-Stage Assembling Jig

are called for, however. The trailing-edge assembly is built up from the aft spar. The ribs are properly located and the skins attached. The spar will be drilled in much the same manner as the front spar, being located by the attaching holes, with possibly one or two tooling holes in addition, depending on the size of the wing.

If instead of nailing strips, rubber-faced pressure pads are to be used to exert pressure at the proper joints, the jig would have to be of the waffle, rather than of the strap type, although gates would be rather clumsy and hard to keep in adjustment. The jig must provide very secure location for the closing ribs adjacent to the flap and other important points. Fittings for the flap brackets would be drilled either in this jig or in one specially provided for that operation. Drilling the fitting holes in this assembly jig has the advantage that it will minimize the chance of errors accumulating in assembly. If these holes are drilled in the spar while unassembled, considerable difficulty will be experienced in ensuring accuracy of location, owing to the small size of the holes.

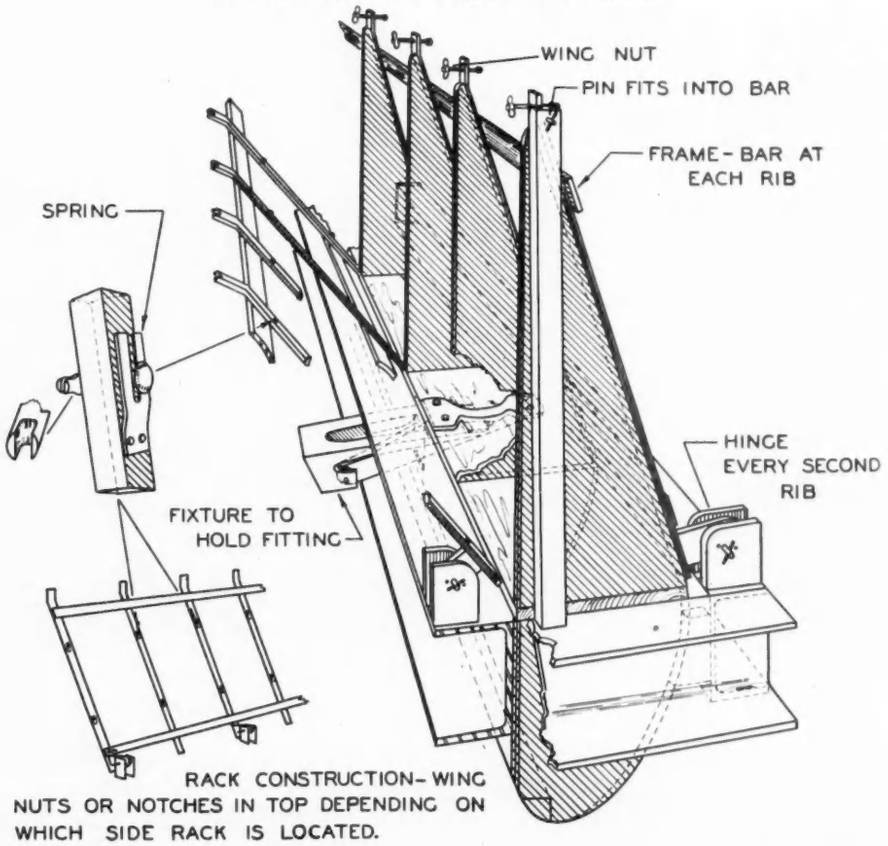
Final assembly of the wing center section can be accomplished with the same type of assembly jib as used in assembling metal wings, skinning of the center bay and locating of the ribs being the only functions it has to serve. Assembly of the outer panels is accomplished in practically the same manner as assembly of the center wing panels, but the final assembly jib is more of the cradle type which picks up the attaching fittings and tooling-pin holes along the spars and on the wing-tip bar. If the production warrants, it is possible to make both the leading edge sub-assembly jig and the trailing edge sub-assembly jig on the same principles as the center-section sub-assembly jigs.

Flap and Surface Controls

Flaps, ailerons and other control surfaces are fabricated as follows: Spars are contoured and beveled to the desired shapes and are then placed in a first-assembly jig, which has locators for proper station location of the ribs, as well as fixtures for drilling all of the fitting holes. Spars are confined by their outer edges, and facilities for locating the ribs are provided. Assembly usually is accomplished in two stages: The leading edge is built up first, ribs are faired and completely skinned; next the trailing edge ribs are attached, faired and skinned. The first-stage jig may have the base made of American channel with trunnion mounts at both ends, to permit rotation of the jig for back-drilling of the holes in the spar and

(*Turn to page* 68, *please*)

Control Surface Last-Stage Assembling Jig



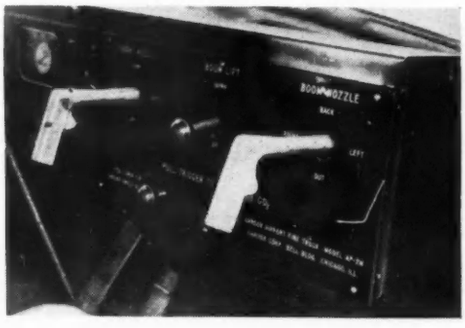
Cardox Airport Fire Truck

RESEARCH activities at Wright Field, the Army Air Forces Materiel Center at Dayton, Ohio, have a two-fold purpose: To discover more efficient methods of destroying the enemy and to develop better means of protecting the lives of the Air Forces. As the result of two years of development work, a new life-saving device—a fire fighting truck which can quickly and effectively smother a fire by throwing thousands of pounds of carbon dioxide on a burning plane in less than three minutes—has been announced by the Equipment Laboratory of the Experimental Engineering Section there. Recently Lt. Col. Rudolph Fink, Chief of the Miscellaneous Unit of the Equipment Laboratory, and W. E. Huffman, civilian engineer, put the truck through its paces. The tests proved successful.

Developed by the Cardox Corp., Chicago, Ill., the Cardox Airport Fire Truck embodies many unique features of design, employs the characteristics of low pressure carbon dioxide systems currently used in war industries. Low pressure CO_2 is stored in large single tanks, holding from one to 25 tons of liquid carbon dioxide which is refrigerated to 0 deg. Fahr., to hold the pressure at 300 psi.

Since immediate extinguishment of crash fires on an air field is the foremost requirement of fire apparatus, the Cardox unit incorporated into its fire extinguishing technique, immediate application and mass discharge of carbon dioxide with enhanced fire extinguishing characteristics. Thus it is possible to approach an airplane crash fire with the ideal technique of fast extinguishment for the purposes of effecting rescue of the plane's crew. If the plane itself can be

(*Turn to page* 82, *please*)



Ready for approaching a crash fire, the Cardox Airport Fire Truck is shown at the right with the front nozzle pointed forward and the boom nozzle raised to position. Above it is a view of the control panel inside of the cab for manipulating the nozzles and controlling the discharge of the CO_2.

Spitfire "V" Fighter i

ONE of the most famous aircraft ever built, the Vickers-Supermarine Spitfire is also one of the most graceful and attractive examples of British design. It is a low-wing monoplane and was the first British fighter embodying all-metal stressed-skin construction to go into large-scale production. In common with its equally famous British counterpart the Hurricane, the Spitfire from the first has carried very heavy armament, and in successive modifications of the original machine this has been considerably increased. Performance has not suffered as a result, for increases in weight have been paralleled by additional power developed in the Rolls-Royce engine.

Recently *Aircraft Production* (London) published an article describing for the first time the constructional features of the Spitfire fighter in its latest form, known as the Mark V, and the production methods applied to it. An abstract of this important information is presented here, supplemented by a number of the illustrations from our English contemporary.

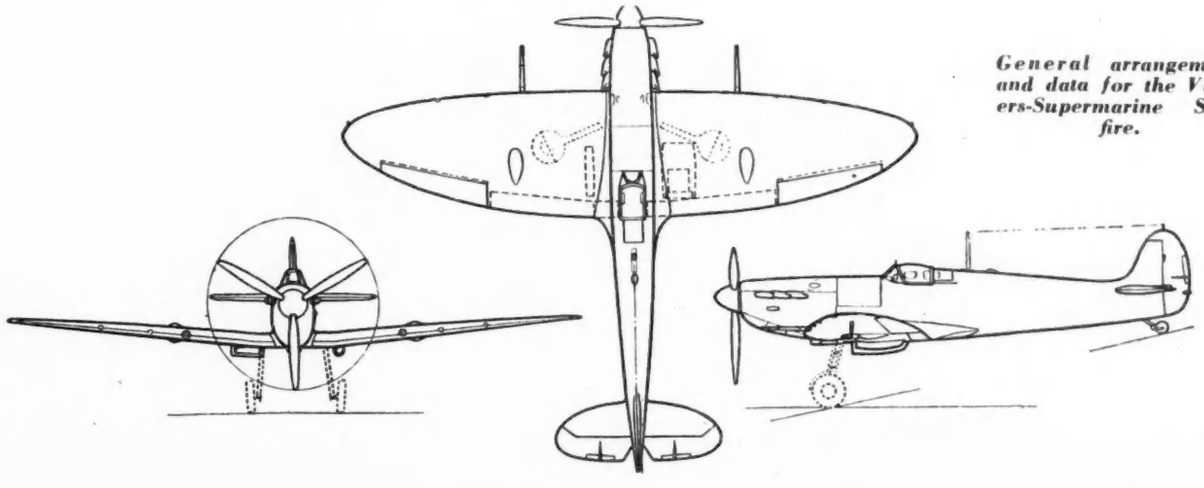
The Spitfire was largely the result of the experience of the Supermarine Co. in building the 1931 Schneider-Trophy monoplanes. Stressed-skin construction at that time was relatively new, and the manufacture of aircraft in "unlimited" quantities raised many problems which could be solved only by a continuous process of adaptation, improvisation and development. The Spitfire was not primarily designed with a view to ease of manufacture. Some of the components, especially those comprising the leading-edge section of the main planes, are particularly difficult when considered from the viewpoint of quantity production.

The center section of the main planes, a familiar feature of most aircraft, is completely absent from the Spitfire, for its main planes are attached directly to one of the main fuselage frames. This member is of massive construction and embodies heavy duralumin stub spars, which extend across the width of the fuselage and project on each side beyond the skin plating to provide pick-up points for the attachment of the main planes. This type of construction immediately raises manufacturing problems, as the wing dihedral, which in the Spitfire amounts to the considerable angle of 6 deg., must be obtained by cranking the spars.

Wing Construction

Theoretically of the two-spar type, the wing structure consists principally of a D-shaped section based on the front spar, which forms, with the leading edge skin, a box of great torsional strength. The rear spar is a relatively light subsidiary member of channel section connecting the trailing portions of the ribs. Actually, apart from giving torsional strength to the structure, the box section of the wing takes a large proportion of the landing loads through the undercarriage. as well as the recoil of the cannon armament. Usually the under-carriage legs are mounted on the center plane section of an aircraft, but in the Spitfire each leg is mounted on the front wing spar near the root end, while the recoil shock of the 20-mm. cannon is taken by a special mounting on the nose of the leading edge.

The main spar is based upon two booms of square section built up from a number of extruded tubes fitted inside each other. At the root, where the boom is practically solid, there are five tubes, the center of the innermost being filled with a 19-in. length of square bar through which a ½-in. hole is drilled. As the loads on the spar decrease progressively towards the wing tip, the inner tubes are terminated, beginning with the innermost, until finally only the two



General arrangement and data for the Vickers-Supermarine Spitfire.

in Production

Part One

Part two will appear in an early issue of AUTOMOTIVE and AVIATION INDUSTRIES.

outer tubes remain. These are then cut away on the upper side to form a doubled-up channel section. After a length of some 2 ft. this is reduced to a single channel, and this section is in turn cut away at one side to form a simple angle section.

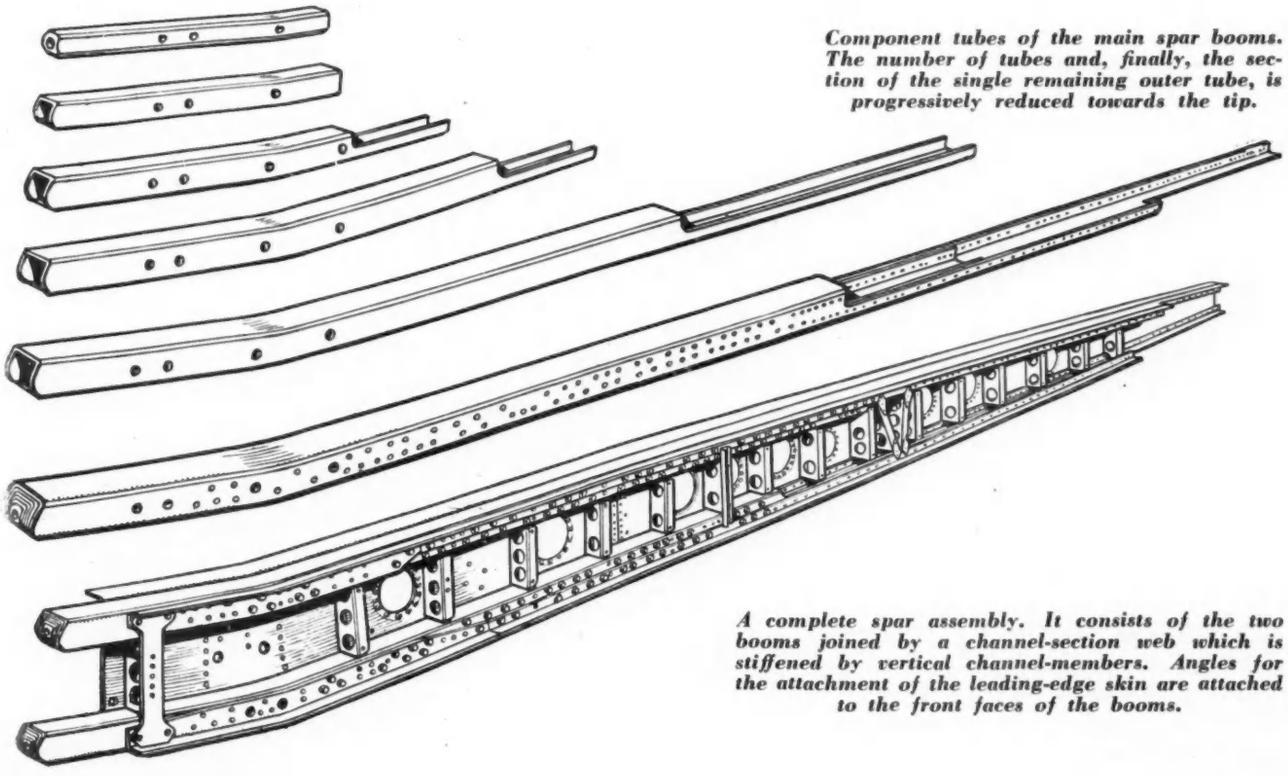
To the rear face of the spar booms is riveted a single web plate flanged at the top and bottom to form a channel section and angles for attachment of the leading edge skin are riveted along the front faces of the booms.

From the production viewpoint, the leading edge skin, made in two sections for each main plane, is one of the outstanding features of the machine. At the nose of the leading-edge the two skin sections are butted together and riveted to a nosing strip on the inside. In the spanwise direction the skin is stiffened by intercostal members of Z-section, while the 21 nose ribs of lattice-and open-girder type give chordwise support. The remainder of the wing is of straightforward construction. Viewed in plan, the bi-elliptical form distinguishes the Spitfire from all other aircraft. Detachable wing tips are fitted and the two spars of the main section of the wing are carried right through the tip, which is attached by fittings on the end of each spar.

In the production of the Spitfire, as of other aircraft at the present time, a large number of women are being employed. By careful planning and by breaking down the different assemblies into simple operations of a repetitious character, difficulties associated with this type of labor have been overcome, and excellent results are being obtained.

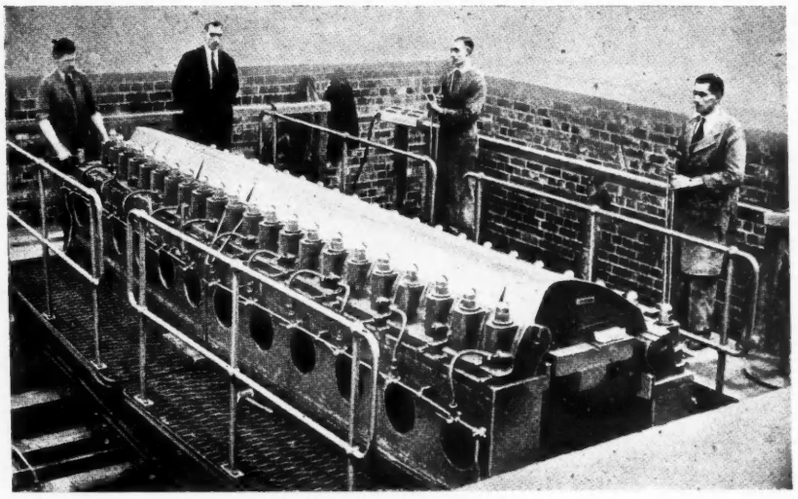
Production methods in general are based upon the system now widely adopted in England, that of dividing and sub-dividing the aircraft and its components into progressively smaller assemblies. As a result, the larger components, such as the main planes and the fuselage, are in an advanced stage of completion before they begin to take shape as a single unit. Thus the time and number of operations required in the final assembly fixture are reduced to a minimum. This system makes possible the dispersal method of manufacture, now so successfully employed.

Sheet-metal parts for the Spitfire are produced by a number of methods. For some parts which have remained unchanged in form from the Mark I Spitfire, large steel blanking and forming dies are used. Jabroc improved-wood press tools are also employed in forming components like the blister for the cannon magazine in the main plane. Former sheet-metal units which are too large or are of a curvature difficult to finish in the press, are shaped by wheeling. The lead-



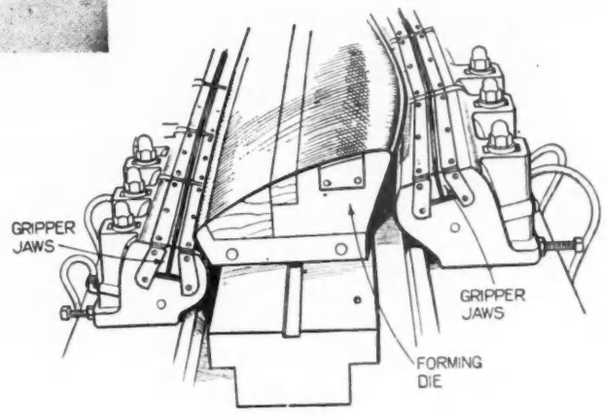
Component tubes of the main spar booms. The number of tubes and, finally, the section of the single remaining outer tube, is progressively reduced towards the tip.

A complete spar assembly. It consists of the two booms joined by a channel-section web which is stiffened by vertical channel-members. Angles for the attachment of the leading-edge skin are attached to the front faces of the booms.



(Left) A twin 300-ton Erco stretching press set up for forming leading-edge skin sections. Key-hole notches for relieving the edge of the blank can be seen along the near side. Independent control is provided for the table-operating rams to assist in proper working of the blank.

(Below) Details of the set-up on the Eroc stretching press shown in Fig. 4. The forming die is of wood with steel inserts at forward and rear edges where the maximum stress is imposed. The grippers are pneumatically operated.

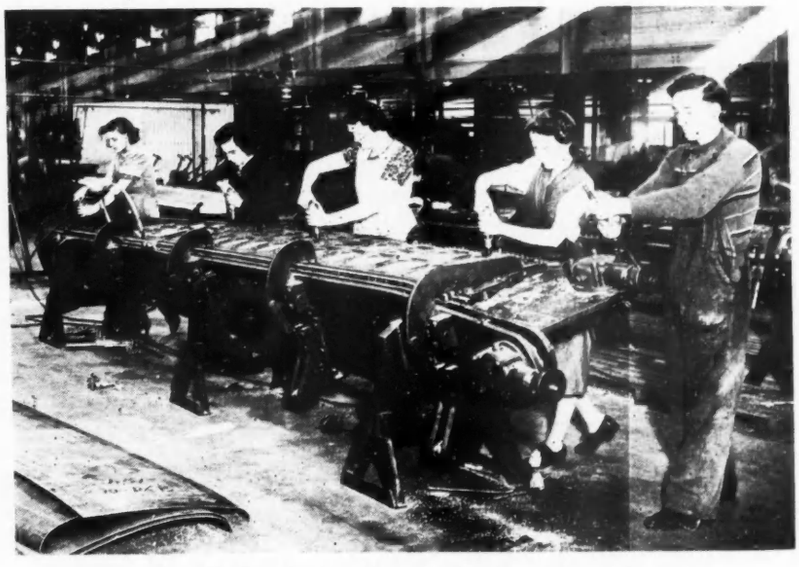


ing-edge skin is formed on a stretching press and provides a convincing demonstration of the possibilities of this method of forming. This component, which is about 14 ft. in length, is formed from a single blank of 14 S.W.G. duralumin sheet. Apart from the size and the heavy material, the forming operation is made more difficult by the shallow curvature, which gives little depth for holding the shape.

From the sheet metal shop the skin sections go to the wing assembly, where they are built into the leading edge, with the first stage of construction the assembly of the front spar. The spar web is in three parts, each of which is a tapering flanged pressing of channel section, hand-finished. These pressings are pre-drilled to jig and are assembled with gusset plates and riveted as a straightforward assembly job on the bench. When this operation has been completed, the components of the spar are brought together in the main drilling jig. Traversing drilling heads are used, mounted on a bridge platform and sliding on inverted V guides at the sides of the jig bed. Drilling is commenced at each end and progresses toward the center, two women being employed. Assembly of the parts is not done in a jig, the booms being clamped to a special type of bench consisting of a number of horizontal bars which permit free access to the underside of the assembly. The spars are positioned at their proper centers by a location block bolted over the root ends. As all holes have been drilled, assembly of the web and skin angles is a simple matter of bolting up.

This is followed by the assembly of the nose rib seatings on the web, and the nose ribs themselves as received ready for attachment from a sub-contractor. At the root end of the spar is mounted a large two-diameter pin known as the pintle; it is the pivot for the retractable under-carriage leg and is bolted to the rear of the spar web, from which it projects at an oblique angle.

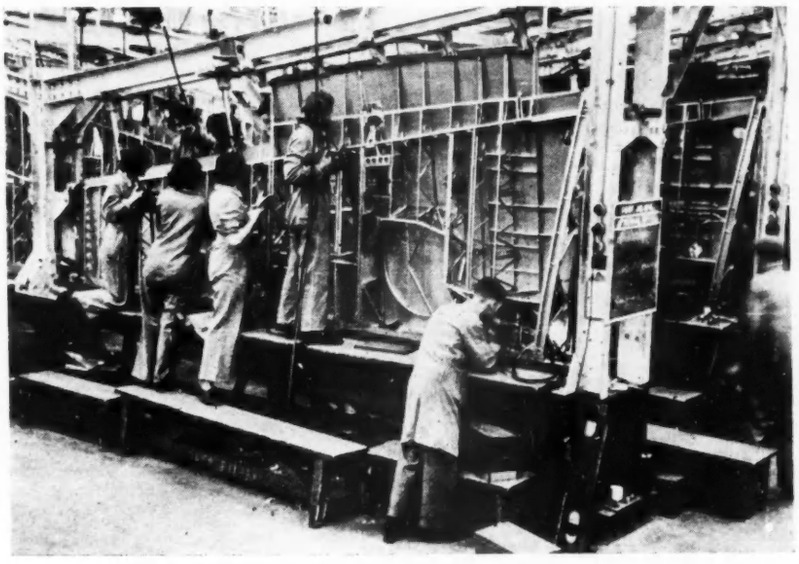
Work proceeds simultaneously on the assembly of the intercostal stiffeners to the underside of the leading edge skin. For this operation the skin sections are held in a vertical stand and clamped in position by heavy latches. Assembly of the stiffeners, which were drilled with the skin section, is a simple matter of tacking them in position and riveting up. Next the



The main drilling jog in which the leading-edge, skin sections and their internal stiffening members are drilled simultaneously. The operator on the right is using an edge-trimming shear

leading-edge assembly is located in a vertical jig with the nose ribs upward for the assembly of the leading-edge skin, the top section of which is first placed in position. For drilling the rib flanges the skin itself is used as a jig.

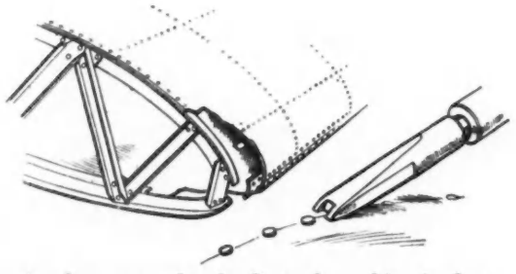
At the nose of the leading edge the two skin sections are brought together to form a butt joint, which is secured by a strip inside the nose and riveted to each section. At this stage of essembly the nosing strip is laid in position over the ribs and drilled from the skin sections, which are then riveted to it. Flush riveting is used, but is not of the type usually implied by the term. Countersunk head rivets are not used. Instead, an external pan head is formed by holding up in the usual way with an internal dolly and hammering the shank into the countersunk hole in the skin. The portion projecting above the surface is then removed by a pneumatic chisel.



A port wing structure in the main assembly fixture. The skin plating has been applied to the upper surface.

When the skin-plating operations have been completed the whole unit is taken to a radial drill for the drilling of the fuselage attachment holes in the spar booms.

With the exception of the interspar section, known as the cannon bay, the assembly of the wing structure is completed in the main fixture illustrated herewith. This is an open frame of rolled steel sections,



At the nose the leading-edge skin is butt-jointed by a strip attached to each skin section by a single line of rivets.

consisting of double end and center columns of channel section placed back to back and braced by horizontal cross members. As with all Spitfire main component assembly fixtures, Consolidated spring-ratchet counter-poises are mounted above the fixture, so that portable pneumatic tools can be suspended at a convenient height and be always ready to hand.

Two wings can be accommodated in each fixture with the roots at the outer ends. The wings are assembled with the leading edge downward, locations for the spar roots and wing tip fittings being arranged on the end and center columns. The top member bridging the columns is inclined at an angle to suit the taper of the wing and carries locations for the aileron hinges and subsidiary locations for the remaining rib tips. In the fixture the wing is arranged so that the rear face of the front spar is at a convenient working height above the stepped platforms.

On the port wing the skin of the upper surface is supported over the radiator bay by a system of light flanged formers and spanwise members having the character of light auxiliary spars. These members are riveted in place between the front and rear spars. A similar construction is used over the wheel housing, which is finally closed by a circular sheet metal partition. To position the leg and wheel housing structure, a jig or "mock-up" leg is fitted to the pintle fitting on the main front spar. The structure is then ready for the skin plating. Assembly of the upper skin is a relatively easy process, as there are few apertures and the surface can be covered by panels of comparatively simple form. Also, accessibility to the interior is easily obtained.

But on the lower surface of the wing the problem of applying the skin is complicated by the number of apertures, such as the radiator compartment, the wheel wells, and openings for the retractable landing lamps. These necessitate the sub-division of the surface into a number of sections which are drilled on the jig from the ribs, for the shallow curvature, combined with the somewhat intricate shapes, make it impracticable to pre-form and pre-drill them before assembly. Holding up for riveting the underside skin is effected through various hand holes and inspection covers, and through the gun-access doors in the upper surface.

Installation of the internal gear follows and includes the running of the electrical wiring conduits, aileron control cables and the fitting of compressed air piping for guns, flaps, and landing-lamp operation. Assembly of the shroud along the aileron gap is one of the last operations to be performed before the wing is removed from the assembly fixture.

A considerable amount of work remains to be done at this stage, and while it is in progress the wing is supported, leading-edge downward, in a felt-lined

(*Turn to page* 82, *please*)

Russian

COMPILED for the most part from information that has been given from time to time in the German magazine *Luftwissen*, an article in *Aircraft Engineering* (London) reviews recent and current design in Russian military aircraft. In an editorial preceding the article it is stated that attempts to obtain photographs of the machines from the Soviet Embassy in London were unsuccessful, and the comment is made that, although presumably the Soviet authorities know their own business best in deeming it inadvisable to release official photographs of their aircraft, the policy thus indicated is in sharp contrast not only with British and American practice but also, to a considerable extent, with German practice. It is admitted, however, that the Soviet policy of secrecy has much to recommend it in wartime. Indeed, applied in peacetime it enabled Russia to spring a complete surprise on the whole world in regard to aviation as well as to military matters when she was eventually forced into the war.

Russian designers, like the German, had the advantage of having the performance and operation of their machines under war conditions tried out on active service in the Spanish Civil War, and that they took the utmost advantage of the experience has been made evident in the striking development that has taken place in Russian aircraft during the past four or five years. It is assumed that the latest types were designed only two or three years ago.

In regard to Russian bombers the SB-2 medium bomber, still in operation in considerable numbers, was extensively used in Spain and is believed to be still in production, while the DB-3, which is considered to be approximate to two British medium bombers—the Whitley in size and the Hampden in performance—is hardly changed from its prototype, the ZKB-26, which flew across the North Pole to America in April, 1939.

Aircraft Engineering comments upon the fact that, having for many years been notable chiefly for a series of enormous and rather unwieldy bombers with a whole row of engines along the leading edge of the wings, Russian design should have come to center around medium bombers of moderate dimensions and performance, and says: "It is a tribute to Russian intelligence that they have had the good sense to withdraw from this concentration on mere size for its own sake and come down to something more practical and truly suited to their real needs. One feels that their lack of performance, except in a weight-carrying sense, would have made the Maxim Gorkis 'cold meat' for enemy artillery and fighters."

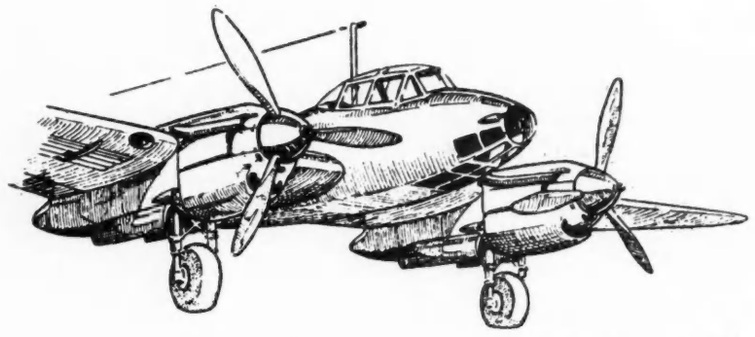
J. H. Stevens, the writer of the article referred to and who has followed closely the development of Russian aviation, ascribes this change of policy to recognition of the fact that the chief role of the Red Air Fleet is close cooperation with the Army, as might be expected in a country where only a large-scale land war can take place. The result is that all types are now adapted to ground attack, even the single-seated fighters being able to carry anti-personnel bombs, if required. (Illustrations of the various Russian aircraft described here were published in the June 15, 1942, issue of AUTOMOTIVE *and* AVIATION INDUSTRIES.)

This large Russian bomber, in which M. Molotov made his recent trips to London and Washington, is equipped with gun turrets in the nose, tail and at the rear of the inboard engine nacelles, each of which also contains the radiator for the pair of engines and houses the retracted undercarriage. It is believed to be of all metal stressed skin construction. Propellers are the controllable pitch type. Russian military policy at one time favored large bombers, but in recent years more emphasis has been placed on medium bombers and fighters adapted to ground attack for close cooperation with the army.

Types of Bombers

The mainstay of the Soviet bomber force seems to consist of three basic types, the SB-2, DB-3 and PE-2, plus variants of the first two, the SB-3 and the DB-3F, all of them two-engined machines.

As mentioned previously, the SB-2, a three-seater, was used in the Spanish Civil War. The SB-3 differs from it mainly in having larger engines in more modern cowling. Like the SB-2, it is of stressed-skin, light alloy construction with a wing span that is peculiarly great relative to the length of the fuselage, a feature of certain other Russian aircraft. The fuselage is slender and narrow, with a gunner-bomb aimer's station in the nose, the pilot's seat over the leading edge and the rear gunner just aft of the trailing edge. The rear gun was originally in a cockpit with a sliding cover, but a gun turret is now provided here. Slightly aft of the rear cockpit is a semi-retractable under-gun position. The front twin gun position has a turret with slots for elevation (from plus 80 deg to minus 50 deg) and a limited traverse, an arrangement reminiscent of an early British turret design.



Courtesy of Aircraft Engineering (England)

The PE-2, one of Russia's new high speed light bombers.

British Combine Photo

Military Aircraft

A review of current types based upon reports published in Germany

By M. W. Bourdon
Special Correspondent of AUTOMOTIVE *and* AVIATION INDUSTRIES in Great Britain

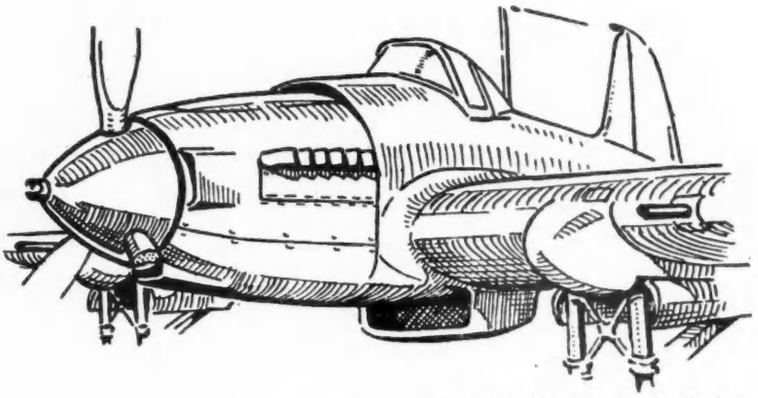
Control surfaces are fabric covered. Single streamlined wires are used for bracing the rear spars of tailplane and fin to each other and to the bottom of the fuselage. Tail control surfaces are horn balanced and mounted on inset hinges. Rudder and elevator have trimming tabs. The undercarriage is retractable.

The SB-2 has the ME-100 (Hispano-Suiza 12Y license) liquid cooled, 12-cylinder V-type engine, rated 860 hp at 11,500 ft. The nacelle cowling has a car type radiator in the nose, with an air outlet controlled by a flap under the nacelle. A two-bladed variable pitch propeller is fitted. The SB-3 has an engine styled M-103, a developed M-100 with a two-speed supercharger, according to German sources. Alternative types of nacelle are used in this case, the first having a ducted radiator below it and oil coolers in the wing, while with the second type both the radiators and the oil coolers are in the wing. A three-bladed propeller is used with a pointed spinner and a Hucks-type starter claw, with which all Russian machines are provided, presumably because of low winter temperatures.

Many SB-3 bombers have dive brakes under the wings, similar to those of the German Junkers Ju88. The SB-3 with wing radiators has a nose gun position like that of the Heinkel He111-K, Mark V, instead of the slotted turret of the SB-2. As regards performance, German sources put the maximum speed of the SB-2 at 260 mph at 12,800 ft and that of the SB-3 at 280 mph.

The DB-3 and DB-3F are three or four seated bombers, the DB-3F being practically identical with the earlier model apart from having a pointed nose instead of a turret and slightly different engine cowling. They are all-metal low-wing, light alloy,

stressed-skin monoplanes, with a single gun in the nose, a dorsal turret aft the wings and a retractable under-defense gun just forward of the tail. As with the SB, the wing span is much greater than the length of the fuselage and the design embodies the large wing-root fillets characteristic of most Russian aircraft. Balance and trimming tabs are fitted to both rudder and elevators. Control surfaces are fabric-covered and the shape of the tail surfaces closely resembles that of the Stormovik (IL-2) single-seated dive bomber, both these machines having been designed by Sergei Ilyushin.

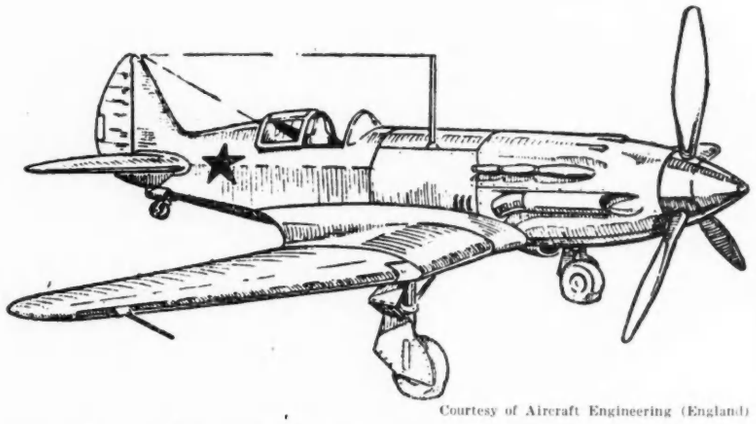


Courtesy of Aircraft Engineering (England)

This sketch of the Stormovik that can be used either as a fighter or dive bomber shows the engine cowling and the cooling inlets.

According to German reports, both the DB-3 and the DB-3F have 1100 hp engines with two-speed superchargers, said to have been developed from the Gnome-Rhone K-14. But the DB-3F has cowling that suggests the use of Wright Cyclone type engines. This machine is said to be slightly faster than the earlier version, which German accounts say has a maximum speed of 265 mph at 16,000 ft.

The PE-2 is a high-speed bomber of obviously modern design, with crew accommodation somewhat on German lines. It is a low wing two-engined monoplane with a rather sharply tapered wing having inset ailerons and flaps. Dive brakes are mounted under the wing, outboard of the engines. The fuselage is slender and well tapered, with crew space for three forward of the wing. There is a small glazed enclosure in the top of the fuselage for the pilot and the rear gunner, radio operator, while the nose forms a prone compartment for the bomb aimer. The tailplane has a slight dihedral angle and the twin fins and rudders have a distinctive rounded shape, which also is found in the YAK-4, a Russian machine for close-support ground work to be referred to later. The engines, in underslung nacelles that project somewhat back of the trailing edge, are liquid cooled, V-type, believed to be the 1300 hp M-38, developed from an original Russian design by A. N. Toupolev known as the M-34. Oil coolers appear to be in ducts on the sides of the cowling. There is a radiator duct under each nacelle and another opening at each side of the wing root of which the purpose is not specified in German reports, though J. H. Stevens, in his article, suggests it may indicate that the cooling system has been divided owing to CG considerations.



Courtesy of Aircraft Engineering (England)

The MIG-3 single seat fighter with liquid cooled engine.

Specialized Aircraft

The Red Air Fleet includes several specialized aircraft for close-support work, and of these the Stormovik (IL-2) and the YAK-4 have appeared since 1939, the former a single-seat dive bomber-fighter and the latter a light, high speed bomber.

The Stormovik apparently surprised the Germans by its success in low flying attacks on ground forces. It is described as of straightforward rather than refined aerodynamic design, with the appearance of a rather bulky single-seat fighter. The fuselage is of mixed construction, partly of light alloy with a wooden stressed skin rear portion. The cockpit is over the wing and is heavily armored. A 12-cylinder liquid cooled engine, the 1300 hp M-38 is used, the vulnerable parts of which are also heavily armored. A three-bladed controllable pitch propeller is fitted. The light alloy stressed skin cantilever wings have inset ailerons and split flaps. Armament consists of two machine guns and two cannon, and for dive bombing operations eight 110-lb bombs under the wings and a large number of 10 and 20-lb bombs.

German periodicals, J. H. Stevens believes, have been confused by the similarity of the PE-2 and the YAK-4. In one journal, what is said to be a later version of the latter is termed the PB-100, but the description given would equally well fit the PE-2. It can be taken, however, that the YAK-4 has a fuselage of steel tube covered at the forward end by light metal and plywood panels and at the rear end by fabric attached to wooden formers. The crew of two has a well-glazed cockpit in the nose with armament for the bomb aimer. The tailplane has a slight

(*Turn to page 72, please*)

Airbriefs

By HENRY LOWE BROWNBACK

The Difficulties

Some of my brother technicians in the industry think that I am pessimistic or too cautious, but this is simply the result of years connected with the industry weeding out that which seems practical from that which might be termed the froth of enthusiasm. One of the greatest problems which aviation has had to face has been trying to live up to promises made by over-enthusiastic supporters of aviation.

I firmly believe that the factories which have built our giant seaplanes could, after sufficient research, build ships far larger and more efficient than anything yet seen and that our engine builders and propeller manufacturers could build powerplants for them, but I don't think that this could be done and 5000 of the machines made by totally inexperienced organizations and crews trained to fly this number in 10 months. I also think that the figures given for time of passage are overly optimistic as they do not take weather into consideration and we have to look to the operating figures of such magnificent organizations as Pan-American Airways or KLM, etc., to find out the average number of trips which can safely be made overseas yearly and not simply count flying time and loading and unloading time at terminii.

Materials

The construction of large fleets of cargo carriers at the same time as many military planes makes the question of available materials very important and will certainly cause some very radical changes in design. Plywood already has begun to displace aluminum alloy in many parts of formerly all-metal aircraft and the use of stainless steel structures welded by the Budd method is gaining. Many things point to a shortage in all materials used in aircraft, even plywood and certain aircraft woods unless facilities are expanded in advance of the real demand and such substitutions of woods and liberalizing of manufacturing technique granted as will permit the utilization of much material now classed as unfit for aircraft use.

In this connection it would be of great benefit to the industry to get back into its ranks many of the old-time wood airplane men who dropped out as the use of metal increased. One of the greatest difficulties faced by the designers of metal airplane structures who turn to wood is getting things overweight.

Plywood

Waterproof plywood is made by gluing sheets of veneer together in a hot press or fever machine using a waterproof plastic bonding material, usually a phenol-formaldehyde resin. In the heavier types this can be used in sheets or else in liquid form applied by a glue spreader. With very thin veneers the glue spreader is impractical and the sheet bonding material has to be used. Inasmuch as this was made by one firm only, it represented a possible cause of delay, but recently a second firm has developed a practical sheet which will give the industry at least two sources of supply. Some designers seem to take delight in specifying plywood that is scarce or hard to make, but this will soon right itself and many very remarkable parts are being made from both sheet and molded plywood stock. The two most popular materials, mahogany and birch, are becoming scarce and it behooves the designer to study his designs and substitute more plentiful woods such as poplar where conditions will permit it and reserve the scarcer woods for parts where their use is imperative. In fact I have often wondered why the Army and the Navy, looking forward toward heavier production, have not gone further into the problem of substituting something more easily gotten for the thing now thought to be the only possible material. Not long ago a man with a great deal of practical experience in the manufacture of aircraft said, "Why don't we get wise and use our material as the Europeans do? We turn down better material for training planes than certain of our allies accept for fighters."

I can remember the story of spruce in the last war. We looked with horror on suggestions to make wing spars of anything but one-piece, prime grade spruce, while everyone else was gluing up short lengths into laminated spars and today we know that the laminated spar is better. We are far too severe today in certain of our specifications and they could be liberalized without danger to anyone and with benefit to the entire industry.

Lighter Than Air

The lighter-than-air men are getting in their innings just at present. After the Hindenburg burned it was freely stated that the day of the balloon had passed and that even the observation balloon would be supplanted by the Autogyro or some form of hovering airplane which could fly home at night or when not observing and do away with the captive balloon's cumbersome ground apparatus. Instead, cities are being protected by vast fleets of barrage balloons and, in certain parts of the world, ships carry one or more barrage balloons to prevent dive bombers from diving down to their decks while the dirigible has proven of tremendous value in convoy duty off of our coast and will shortly be of even greater value. I have often felt that the wave of feeling against the dirigible was unfortunate and that we perhaps made a tremendous mistake in not trying the further development of Ralph Upton's "Tin Bubble."

Glider Take Offs

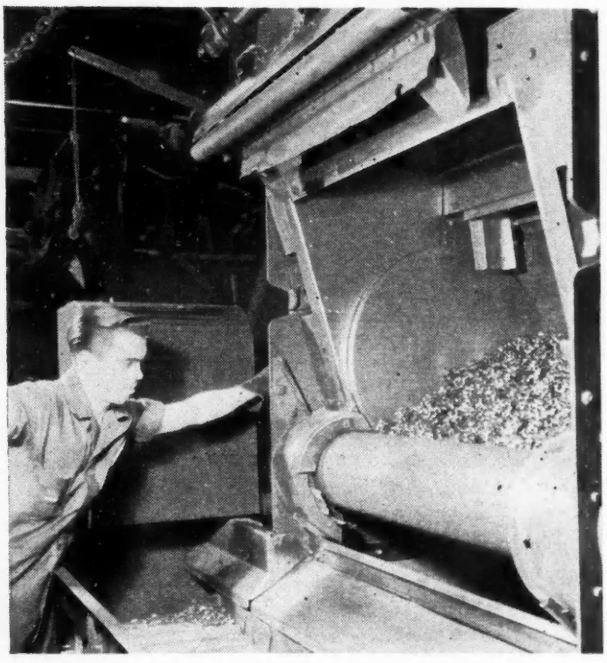
According to the newspapers, apparatus originally intended to pick up mail on the fly will be used to launch gliders. The apparatus has given some very convincing demonstrations for the armed services and, while I cannot give details here, I can say that a plane flying over a glider resting on a field can hook to it and take it off without stalling and the maximum acceleration of the glider about equals the acceleration due to gravity.

A few days ago the final demonstration was given and consisted of having a light plane fly over a second light plane with the engine still in place, but with the propeller removed and take it off loaded without stalling the tow plane. This test was made with a device invented by one of the world's greatest glider pilots, Richard duPont, and is but one of the many contributions of the glider enthusiasts who used to gather near Binghamton, to the war effort of the nation.

Research Center

One of the finest things which has ever happened in aviation came about when Mrs. Daniel Guggenheim generously gave the Long Island estate of her late husband to the Institute of Aeronautical Services as a research center and Glenn Martin added a $450,000 endowment to the gift. Lester Gardner has done one of the outstanding jobs of all time in the organizing of the IAS and I am more than happy to see this great good fortune come to him and to the aeronautical industry through the generosity of these two great Americans. Major Gardner's place in aeronautical history is secure and he himself carved it out through sheer hard work and great organizing talent.

MEN and MACHINES

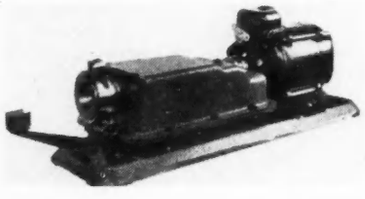


This Tumblast Wheelabrator, an airless abrasive blast cleaning machine built by the American Foundry Equipment Co., Mishawaka, Ind., is being used effectively in the cleaning of the metal links used in the manufacture of machine gun cartridge belts.

AFTER extensive research and experimentation, the Jones & Lamson Machine Co., Springfield, Vt., has put into production its new 9A and 10A saddle-type universal turret lathes. The No. 9A machine has a maximum round bar capacity of 3½ in. and will swing 23½ in. over the way covers; the No. 10A machine has a maximum capacity of 5 in. and will swing 27½ in.

Incorporating many production features, the lathe is equipped with a power-operated saddle, turret, carriage, and cross-slide. Single-lever speed and feed selectors and a power-operated bar-feed mechanism are other features of the design. A reversible torque motor controlled by an electric switch located on the headstock actuates, through a gear train, the stock-feed-chuck lead-screw which either advances or withdraws the stock.

PRODUCERS of airframes and other structures employing fabricated tubing will be interested in a unique type of tube beading machine recently developed by The Wayne Pump Co., Fort Wayne, Ind. This machine can be used for beading tubing of all ordinary materials such as aluminum, copper, and steel. Its outstanding features are the speed with which the operation is performed, and the precision with which the bead location and formation are developed.



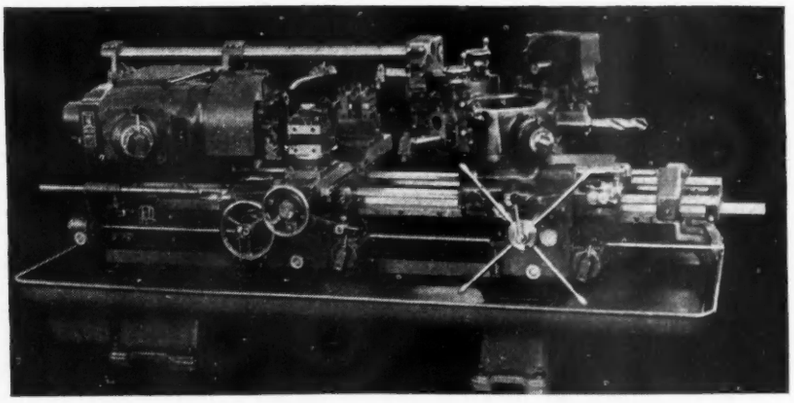
Tube beading machine made by the Wayne Pump Co.

The Wayne tube beader incorporates a motor which drives a cam at motor speed. After the tube is inserted in the chuck, the operator touches a button which puts the machine through its cycle. At the outer end of the cam is a small roller about one-half the diameter of the tube. This roller produces the bead on the inside of the tubing at a predetermined distance from the end. Normally the roller spins at motor speed and in concentric position. When the machine goes through its cycle, the roller is forced to rotate on an eccentric axis by means of double helices. The roller remains eccentric for about three-fifths of a second, whereupon it returns to its concentric position; and the tube is withdrawn from the chuck. The roller makes about twenty complete revolutions in its eccentric position, each time rolling more and more of the material into its ultimate beaded position. The chuck which grips the outside of the tubing control the outside dimensions and contour.

Since the roller is so arranged as to roll with the metal much in the manner of a roller bearing, there is no tendency to scar the surface of the bead. Microphotographs show the surface disturbed to such a slight degree that extrusion marks both on the inside and outside of the tube run clear through the beaded portion. The anodic treatment is similarly undisturbed by this process. One of the principal features of a tube which is beaded by this process is the fact that the wall thickness shows no measureable difference after beading.

Machines have been developed in

(*Turn to page* 62, *please*)



This new No. 9A Jones & Lamson saddle-type universal turret lathe with enclosed chucking equipment has a round bar capacity of 3½ in. and will swing 23½ in. The new 10A machine has a slightly larger capacity.

Kanzler Leaves Detroit To Accept New WPB Post

Former Chief of Automotive Branch Becomes Chairman in Charge of Program Progress; Air Experts Visit Detroit

Promotion of Ernest C. Kanzler, former chief of the Automotive Branch of WPB, to the position of deputy chairman of the WPB in charge of program progress is virtual acknowledgment that the automotive industry's conversion to war production is complete. In accepting the new appointment from Donald M. Nelson, WPB chairman, Kanzler will follow the overall progress of the war production program, compare it with objectives, locate bottlenecks and weak spots, attempt to maintain balance in production schedules, and avoid dislocations in the supply system. Some of the vexing material shortages that currently are hampering production will come within his scope. He will work in close cooperation with W. L. Batt and J. L. Knowlson, vice-chairmen of WPB, and Amory Houghton, director general of operations.

Upon his departure from Detroit for his new post in Washington, Kanzler said, "I could not leave my Detroit activities with the WPB without paying tribute to the automotive industry and to the plants in the Michigan region which have cooperated so wholeheartedly in the war effort. The magnificent job done by the industry . . . has established a reputation for this district throughout the world. One has but to look at a list of the visitors to Detroit to realize that it has become the mecca for those looking for the Arsenal of Democracy. . . . I expect to keep in close touch with the Detroit war activity and want to express my sincere thanks and appreciation to all those who have so wholeheartedly cooperated with us."

Alvan Macauley, president of the Automotive Council for War Production, expressed the sentiment of the automotive industry on Kanzler's departure when he said, "The appointment of Mr. Kanzler as deputy chairman of the WPB is a signal recognition for a job well done. As the chief of the Automotive Branch of WPB for the past six months, Mr. Kanzler has served our nation admirably. He tackled realistically the monumental job of converting the automotive industry to war production. His insight into the difficult problems involved, and the energetic way in which he sought solutions, contributed much to the speed of conversion. While the automotive industry will miss his helpful approach in ironing out production and materials difficulties, we wish him well in his larger assignment of serving his country in Washington."

Kanzler was appointed head of the OPM Automotive Branch Jan. 5, 1942, leaving his position as president of Universal Credit Corp. When WPB was created, he became head of that agency's Automotive Branch Jan. 21, 1942. His elevation to deputy chairman of WPB came 6½ months later, on Aug. 4. His shift to Washington also removed him from the job of director of the Michigan Region of WPB.

Most recent visitors to the arsenal

(*Turn to page* 56, *please*)

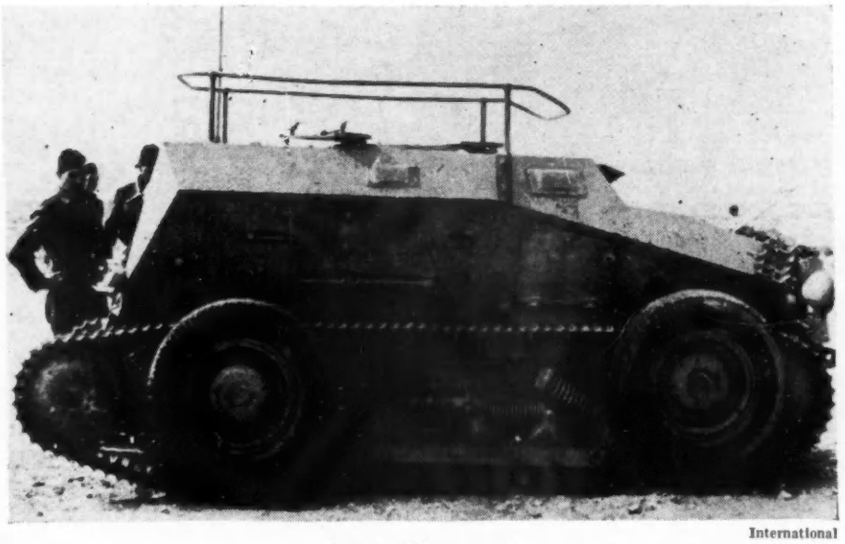
Chrysler and Olds Receive New Award

Two automotive companies, the Chrysler Corp. and the Oldsmobile Division of General Motors Corp., are among 20 industrial plants in the U. S. to receive the New Army-Navy Production Award in recognition of outstanding performance on war work.

Maj.-Gen. Levin H. Campbell, U. S. Army chief of ordnance, made the award to Chrysler at ceremonies Aug. 10 at the Chrysler Tank Arsenal. Chrysler has just completed conversion of the arsenal from the production of M-3 medium tanks to the newer M-4 tank with its all-welded hull. Chrysler is the first tank plant to receive the Army-Navy award. It has produced more than half the medium tanks made in the U. S.

Oldsmobile received the award for the manufacture of guns and shells for the armed forces.

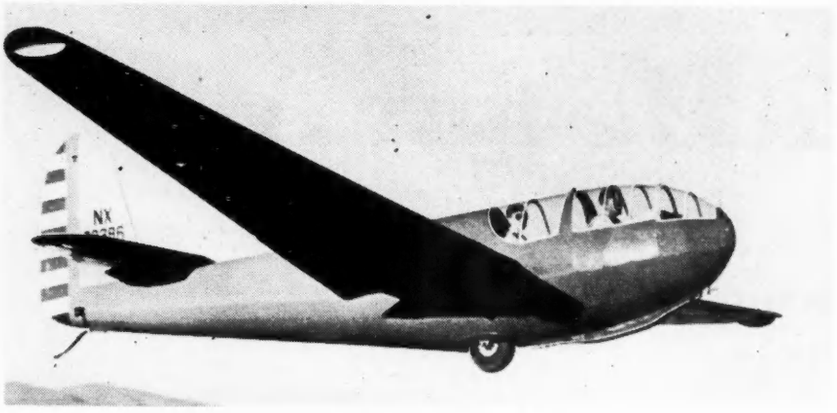
Others among the 20 initial winners of the Army-Navy awards were Bendix Radio Division of Bendix Aviation Corp., Baltimore; Boeing Airplane Co., Seattle; and Hamilton Standard Propeller Division of United Aircraft Corp., East Hartford, Conn.



International

Nazi Mongrel

Confidential reports from the North African theater tell of the many ingenious methods employed by the Nazis to keep their motorized equipment in operation. They not only make sure that damaged units are repaired, but also incorporate in the original design features which give the utmost in mobility. This half-track observation car, said to have been captured by the British before the invasion of Egypt, sports two sets of wheels which can be lowered to permit higher speeds wherever ground conditions are favorable to fast travelling.



All-plywood Glider Passes Army Tests

Successful tests of this all-plywood glider built by Bowlus Sailplanes, Inc., were made recently under Army auspices in Southern California. Company officials say that it is almost impossible to detect the glider by the use of listening devices since it is almost completely nonmagnetic. Known as a two-place transitional trainer, it is said to have flown at a speed of approximately 112 mph.

Allocation of Steel Becomes Major Problem

Distribution Hits Snag as Potential Steel Output Rises; Steel Recovery Corp., MRC Agent, to Handle Steel Scrap

By W. C. Hirsch

Announcement by the American Iron & Steel Institute that addition of 628-350 tons to the country's steel making capacity in the first half of 1942 has raised potential annual output to 89,198,320 tons (probably half of the world's aggregate steel-making capacity) has strengthened the view that tangles in the flow of steel to war materials plants result chiefly from flaws in distribution, with paucity in the supply of certain basic materials an aggravating factor.

No one recognizes better than do those charged with supervision of the allocation of steel that progressive improvement of procedure is necessary and possible. In the very nature of steel manufacturing, however, time lags between the various steps from the ingot to the finished product must be taken into consideration.

When such incisive changes as the need of much larger tonnages of plate and sharp diminishment in the requirements of certain classes of finished flat steel, such as tin plate and automobile sheets necessitate the rearrangement of mill programs and equipment, perfection can hardly be attained overnight.

Opinion is divided as to whether shortcomings can be cured more quickly by a change in the over-all organization. That unification is the aim kept in mind is shown by organization of the Steel Recovery Corporation, which has just been announced and which, acting as agent of the Government's Metals Reserve Company, is to handle the difficult steel scrap problem, much as does the Copper Recovery Corporation that of secondary copper. The Steel Recovery Corporation will have its headquarters at Pittsburgh.

The attitude of the Government toward repeated suggestions that higher scrap ceiling prices would bring out considerable in the way of additional tonnage, is obviously that if this scrap is available, it should come out immediately regardless of price. Tightening up of the regulatons governing molybdenum reflect the increasing need of that alloying agent, especially for shipment to our Allies.

While stocks of beryllium are reported as satisfactory, the shortage of copper retards the output of urgently needed alloys (in which the beryllium content is seldom over 2¼ per cent with copper making up the rest of the compositon) for the making of springs and diaphragms in aviation instruments and of non-sparking safety tools.

Exaggerated reports of activity in Cornish tin mines are met with statements by tin specialists that the Cornwall mines, which have been famous since the days of Julius Caesar, can at best produce 3000 tons a year today. The British government, following long negotiations, has closed a contract with Nigerian tin producers for their output. Nigeria and the Belgian Congo can provide up to 40,000 tons a year, it is reported from London.

MEN . . . . . .

J. S. Allard, vice-president of Curtiss-Wright Corp., in charge of the export sales division, has been granted a leave of absence to serve as a lieutenant-colonel in the U. S. Army Air Forces.

Edward S. Ingham, formerly sales manager of the Harley C. Loney Co. and secretary of the National Wheel & Rim Association, has been placed in charge of priorities for the Firestone Steel Products Co., Akron, Ohio.

C. W. Strawn, vice-president of Bliss Strawn Distributing Co., Detroit, has been appointed manager of the newly established inventory and requisitioning branch in the Detroit regional office of the WPB. This branch will aid in locating "frozen," idle and excessive inventories of critical war materials.

Robert L. Clarkson, board chairman of American Express Co., has been elected a director of Republic Aviation Corp.

David G. Fleet, formerly assistant to the general manager of Consolidated Aircraft Corp. and a son of Maj. R. M. Fleet, former president of Consolidated, has been named executive vice-president of Vultee Aircraft, Inc.

Horace E. Dodge, Jr., son of one of the founders of Dodge Bros. Corp., has been commissioned a major in the U. S. Army.

Oscar Webber, vice-president and general manager of the J. L. Hudson Co., Detroit department store, has been appointed deputy chief of the Detroit Ordnance District by Col. A. B. Quinton, district chief. Webber will become chief of the district when Col. Quinton is assigned to field service.

Harry Burnham, formerly chief of the industrial arts division of the Flint public schools, has joined the industrial relations department of the AC Spark Plug Division of General Motors.

William E. Berchtold, account executive on the De Soto account for J. Sterling Getchell, Inc., has been elected a director of the advertising agency.

M. J. McCarthy, safety director of the Fisher Body Division of General Motors

(*Turn to page 50, please*)

CALENDAR

Conventions and Meetings

SAE West Coast Transportation and Maintenance Meeting, Los Angeles, Aug. 20-22
National Petroleum Association, Atlantic City, Annual Mtg. .....Sept. 16-18
SAE National Aircraft & Production Mtg. Los Angeles .....Oct. 1-3
Natl. Safety Council, Chicago, Annual Mtg. .....Oct. 5-9
Natl. Metal Congress & Exposition, Cleveland .....Oct. 12-16
American Welding Society, Detroit, Annual Mtg. .....Oct. 12
American Society of Tool Engineers, War Production Conference, Springfield, Mass. .....Oct. 16-17
SAE National Fuels & Lubricants Mtg., Tulsa .....Oct. 22-23
Natl. Lubricating Grease Inst., New Orleans, Annual Mtg. .....Oct. 25-29
Natl. Safety Congress and Exposition, Chicago .....Oct. 27-29
Natl. Industrial Chemical Conf. & Exposition, Chicago .....Nov. 17-22
American Petroleum Inst., Annual Mtg., Chicago .....Nov. 9-13
Amer. Society of Mechanical Engrs., New York City, Annual Mtg. Nov. 30-Dec. 4
Highway Research Board, St. Louis, Mo. .....Dec. 2-4
SAE War Production-Engineering Mtg., Detroit .....Jan. 11-15

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE AND AVIATION INDUSTRIES

Further expansion of general business activity is indicated. The index of *The Journal of Commerce*, without seasonal adjustment, for the week ended August 1 stands provisionally at 125.2 per cent of the 1927-29 average, as against 124.9 for the preceding week. The adjusted index of *The New York Times* for the week ended July 25 rose to 131.8 per cent of the estimated normal from 130.4 for the week before and was at the level recorded a year ago.

Department store sales during the week ended August 1, as reported by the Federal Reserve Board, were 6 per cent below the comparable amount last year; but for the four weeks then ended sales were 3 per cent above the total a year ago.

Railway freight loadings during the week ended August 1 totaled 863,528 cars, 0.9 per cent more than the number for the preceding week but 2.1 per cent below the comparable figure in 1941.

Electric power output rose more than seasonally in the same period and was 11.8 per cent greater than a year ago, as against a similar excess of 12.6 per cent a week earlier.

Crude oil production during the week ended August 1 averaged 3,383,050 barrels daily, 307,550 barrels below the figure for the preceding week and 459,750 barrels less than the average output recommended by the Office of the Petroleum Coordinator for July.

Average daily production of bituminous coal during the week ended July 25 was 1,838,000 tons, as compared with 1,836,000 tons for the week before and 1,793,000 tons a year ago.

Business failures during the week ended July 30 totaled 168, as compared with 190 in the preceding week and the same number in the comparable period last year, according to the Dun & Bradstreet report.

Professor Fisher's index of wholesale commodity prices for the final week of July was unchanged at 108.4 per cent of the 1926 average, thus remaining at the highest level reached this year.

Member bank reserves rose $57 million during the week ended August 5, and estimated excess reserves increased $50 million to a total of $2,250 million. Business loans of reporting members increased $2 million in the preceding week and stood $385 million above the total a year earlier.

Change Rubber Order

Three changes in the chlorinated rubber order, M-46, have been made by the Director General for Operations.

The first removes permission to use chlorinated rubber in the manufacture of electrical insulation. Substitutes are available. The second permits the use of chlorinated rubber in the manufacture of core binder cement for use in casting equipment made for the armed services. The third continues the order in effect until revoked. It had been due to expire on July 31.

Half-Track Velocipede

One could call this Nazi vehicle a motorcycle, yet the picture reveals constructional details not commonly associated with this type of machine. The British, who captured it, say it carries two small guns, several men, and some light equipment.

British Combine

UAW-CIO Membership Highest in History

WLB Hearings on Ford and Chrysler Cases Adjourned for Week During Annual Convention; Thomas Reveals Figures

Dues paying membership of the UAW-CIO numbered 612,702 during May, the most recent month for which figures are available, making it the largest labor organization in the U. S., if not the world, according to the annual report of President Roy J. Thomas submitted to the annual convention in Chicago. Only two AFL unions, the carpenters and the teamsters, claim to have membership of 600,000, while the British Miners Federation is the only foreign labor body exceeding 600,000 members. Average monthly paid-up membership for the fiscal year ending April 30 was 512,411, nearly a 100 per cent increase over the 292,091 monthly average in the previous fiscal year.

Plants and companies under contract to the UAW-CIO increased 35 per cent during the year, from 982 to 1328 establishments. These plants employ 898,860 workers, which indicates that 286,158 employes, or 32 per cent of the workers, in the plants covered by UAW-CIO contracts are not members of the union. A check of 1000 contracts covering the union showed that 62 per cent provide for the union or closed shop, 12 per cent have the dues checkoff provision, and 15 per cent include the maintenance of membership provision that is being specified in recent cases before the War Labor Board. A year ago only 31 per cent had the union shop and but 3 per cent the checkoff. Fifty-three per cent of the contracts call for the shop steward system, 59 per cent grant an extra bonus for night work, 58 per cent give vacations with pay or a bonus in lieu of vacation, 21 per cent contain arbitration clauses and 81 per cent provide for war seniority protection.

In the year ending July 1, the UAW-CIO has been on the ballot in 298 NLRB elections, of which it has won 232, or 78 per cent. The AFL won 19 elections, or 6 per cent, unaffiliated unions won 18 and in 29 polls a majority voted for no union. In the 298 elections the UAW-CIO received 75,019 of the 124,466 ballots cast, or 60 per cent. The AFL received 10,289 votes.

The report praised the impartial umpire system in the General Motors contract, saying it "provides machinery to obtain settlements that could be gained by no other means, even by strike action." Thomas estimated that monetary reimbursements to GM workers as a result of umpire decisions totaled approximately $1 million in the last year. Thomas also asserted that the union shop clause in the contract with Ford Motor Co. has been completely successful in maintaining stable labor relationships. The Ford division in the last year received wage increases amounting to $52,800,000. The number of Canadian workers under UAW-CIO contract has increased from 9755 in July, 1941, to 28,953 today.

Receipts of the union for the year ending April 30 totaled $3,293,413, according to Secretary George F. Addes, an increase in income of over 80 per cent from the previous year. Expenditures totaled $2,981,749, an increase of 93 per cent over the 1940-41 period. Expenses of the Ford Division, including some organizing costs, were $159,106 compared to $74,851 for the GM

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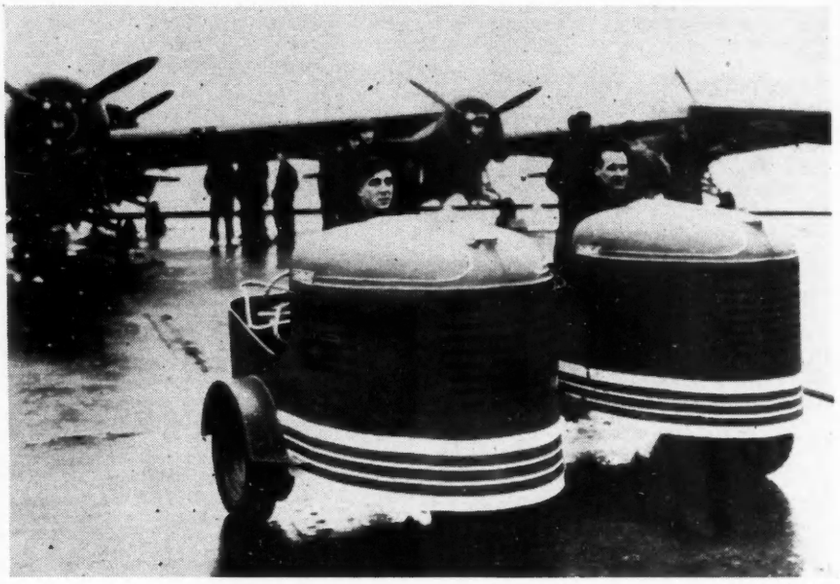


British Combine

Carrier-Based Tow Truck

American-built miniature tow trucks, which resemble the "dodge-ems" found in many amusement parks, are put to good use by the British on H. M. S. Illustrious to tow fighting planes into position on the carrier's flight deck

Shift Motor Transport Service

Ordnance Dept. to Control Unit Formerly Under Quartermaster Corps; Will Buy and Maintain All Army Vehicles

Shifting of the Motor Transport Service from the Quartermaster Corps to the Ordnance Dept. in order to centralize the responsibility for all the U. S. Army's motor vehicles, both general and combat, under one authority has been announced by the War Dept. The change, effective Aug. 1, will place the design, purchase, and maintenance of all the Army's vehicles, including tanks, armored cars, jeeps, reconnaissance cars, ambulances, cargo trucks, and special purpose units, under the Chief of Ordnance.

Thirty thousand Army personnel, 12,000 military and 18,000 civilian, will be transferred from the Quartermaster Corps to the Ordnance Dept. under the change. Officers not transferred to Ordnance will be reassigned to Quartermaster duties when their services no longer are required in motor transport activity.

In the field, the change will mean the integration of maintenance work on both general and combat vehicles in the same Ordnance repair shops and by the same mechanics. This will eliminate duplication of facilities for field maintenance and will coordinate automotive maintenance and depot units under the Ordnance Dept. Thus, a tank and a cargo truck will be serviced by the same group of mechanics and shop facilities rather than by separate groups.

In Detroit an Ordnance Combat-Automotive Center has been created under the direction of Col. A. R. Glancy, who has been advanced to deputy chief of ordnance. Col. Glancy has been serving as a civilian consultant on production to Lieut.-Gen. Brehon Somervell in the Services of Supply. Prior to that he was director of ordnance procurement in OPM. He is a former general manager of the Pontiac Motor Division of General Motors. The new center will have its headquarters in the National Bank, Union Guardian and Buhl buildings in downtown Detroit. The Motor Transport Supply Depot at Fort Wayne will continue to function under command of Col. Ray M. Hare but will be under the direction of the new Ordnance combat-Automotive Center.

Research, design, development, procurement, and distribution of all motor vehicles will now come under the Ordnance Dept., with the procurement and distribution centered at Detroit where many of the vehicles are manufactured. All motor transport bases, supply depots, school maintenance installations, and motor repair shops will also come under the Ordnance Dept. However, the arm or service particularly interested in special motor vehicles may have the authority for designing and developing them, such as bomb carrying trucks for the Air Corps. This also applies to motor vehi-

(*Turn to page* 58, *please*)

PUBLICATIONS

E. I. du Pont de Nemours & Co. has just issued a new 72-page illustrated manual **Molten Salt Baths.** Please use your company letterhead in requesting copy.*

Standard Conveyor Co.'s Condensed General Catalog No. 307 gives full information on a line of **conveyors** engineered to meet all package handling problems.*

A new 20-page catalog, just issued by Ex-Cell-O Corp., gives complete specifications and illustrations on its entire line of **precision machine tools, cutting tools, and related products.***

A 20-page booklet **Heat Treatment in Ajax-Hultgren Electric Salt Bath Furnaces,** has been issued by Ajax Electric Co., Inc. It is illustrated and shows modern installations of the immersed electrode salt bath furnace with the self-circulating, self-heating feature. Operating principles are discussed, standard sizes are shown, etc.*

The current issue of Wheelco Comments, published by Wheelco Instrument Co., has a feature article on the use of temperature control instruments in a pioneer midwestern heat treating plant.*

A new 14-page bulletin on **welding electrode conservation** has been announced by Air Reduction. The booklet consists of a series of shop posters and is designed to help arc welding operators do more useful work with every electrode.*

New Departure Engineering Service Series—Part Two—has just been announced. It contains information on the **details of shaft and housing design** for the application of bearings.*

An attractive booklet describing the highlights of its 25-minute motion picture **Keep 'Em Rolling,** showing the importance of rubber in the war effort, has just been published by B. F. Goodrich Co.*

A new manual, **The Care and Operation of a Lathe,** has just been published by the Sheldon Machine Co., Inc., 4240 N. Knox Ave., Chicago, Ill. It is pocket-size and is written for the apprentice or student machinist. Price per copy is 50c.

The July issue of Bakelite Review contains two timely and interesting articles, **Plastic Parts for Machine Tools,** and **Finishing of Resin-Bonded Plywood for Aircraft Construction.***

A new 8-page booklet on **air-cooled voltage regulators** has been announced by Westinghouse Electric & Mfg. Co. It gives a quick non-technical summary of the outstanding highlights of the Type SA air-cooled induction feeder regulator.*

Andrew C. Campbell Division, American Chain & Cable Co., has issued a new booklet describing and illustrating the Campbell **Model 425 Cutalator Abrasive Cutting Machine.***

How Aircraft Designing Engineers Use Ampco Metal is the title of an 8-page bulletin just issued by Ampco Metal, Inc. It describes and illustrates the use of Ampco Metal by the aircraft industry.*

American Engineering Co., The Lo-Hed Hoist Division, has issued a new booklet titled **Lo-Hed, The Balanced Hoist.** It is a condensation of the complete catalog and gives the essential information on classes and types of Lo-Hed Hoists.*

*Obtainable through editorial department, AUTOMOTIVE *and* AVIATION INDUSTRIES. Address: Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

Fred S. Pearse

Fred S. Pearse, 65, superintendent of the machine shop at the Dodge Division of Chrysler Corp. for 25 years, died Aug. 2 at his home in Detroit after a long illness.

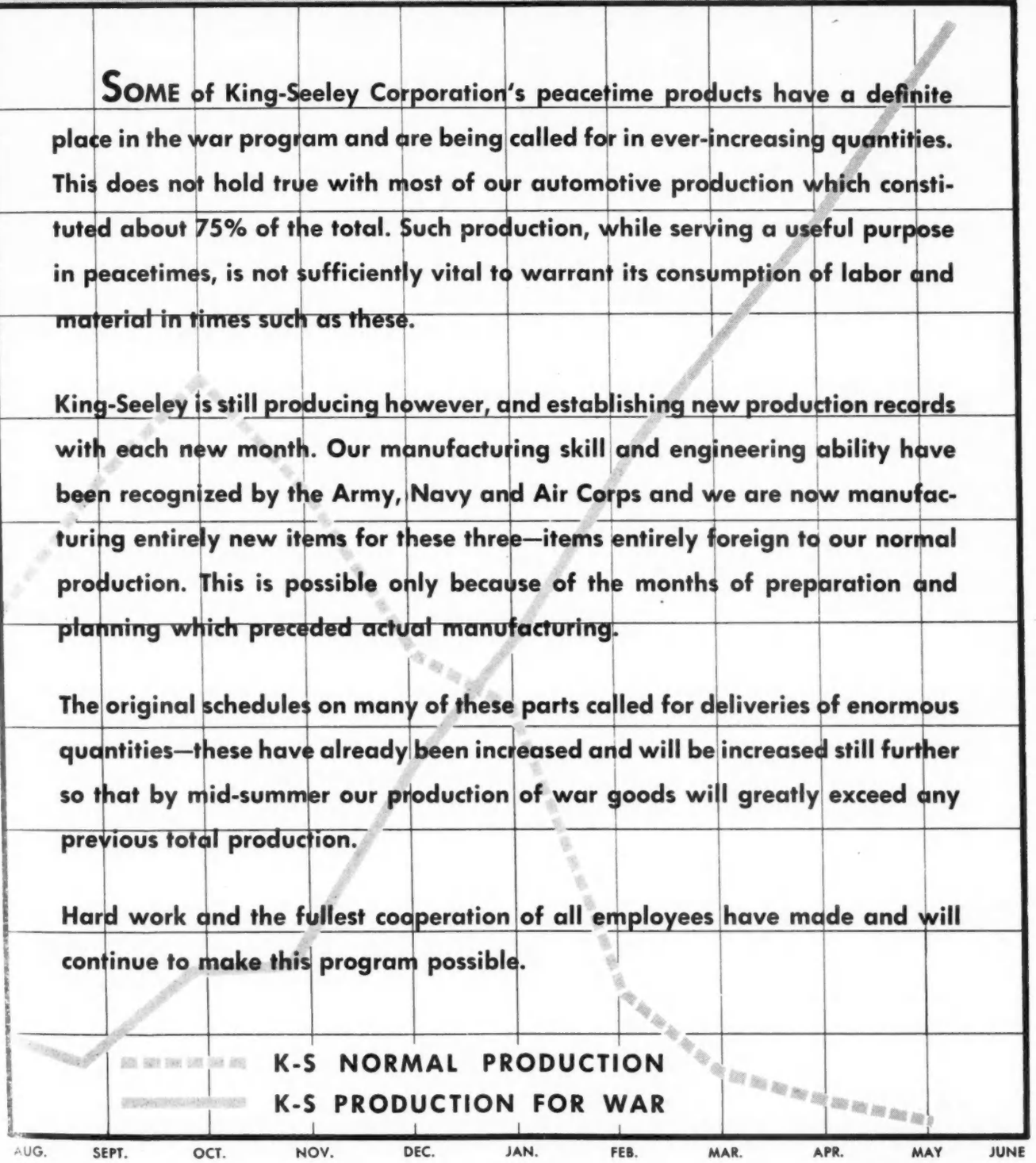
TRANSITION

SOME of King-Seeley Corporation's peacetime products have a definite place in the war program and are being called for in ever-increasing quantities. This does not hold true with most of our automotive production which constituted about 75% of the total. Such production, while serving a useful purpose in peacetimes, is not sufficiently vital to warrant its consumption of labor and material in times such as these.

King-Seeley is still producing however, and establishing new production records with each new month. Our manufacturing skill and engineering ability have been recognized by the Army, Navy and Air Corps and we are now manufacturing entirely new items for these three—items entirely foreign to our normal production. This is possible only because of the months of preparation and planning which preceded actual manufacturing.

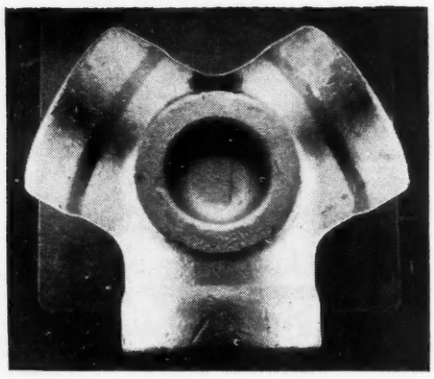
The original schedules on many of these parts called for deliveries of enormous quantities—these have already been increased and will be increased still further so that by mid-summer our production of war goods will greatly exceed any previous total production.

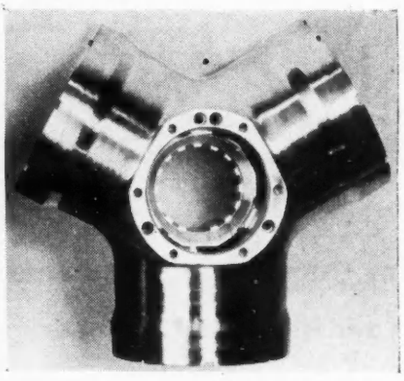
Hard work and the fullest cooperation of all employees have made and will continue to make this program possible.



KING-SEELEY CORPORATION
ANN ARBOR, MICHIGAN

PEACETIME MANUFACTURERS OF K-S ELECTRIC TELEGAGES, K-S SPEEDOMETERS, HANDY VARI-SPEED GOVERNORS SERVO MECHANICAL GOVERNORS AND HANDY DOUBLE ACTION OIL FILTERS FOR THE AUTOMOTIVE AND ALLIED INDUSTRIES





Aviation News Features

Eighty-five Per Cent Machined Away

Here is an excellent illustration of what is meant by the "machining" of an aircraft part. Originally a 372-lb forging, this Curtiss electric-propeller hub is whittled down during 50 machining operations to a final weight of only 56 lb.

MEN

(Continued from page 46)

Corp., has been appointed chairman of the Michigan Committee for Conservation of Manpower in War Industry, a committee formed by the Department of Labor to reduce industrial accidents.

Richard T. Purdy, formerly manager of the municipal buying department of the First of Michigan Corp., Detroit investment banking concern, has joined the staff of George Romney, managing director of the Automotive Council for War Production.

R. H. Boundy, of the Dow Chemical Co., and **Dr. R. V. Yohe,** of the B. F. Goodrich Co., have been appointed members of the Synthetic Rubber Technical Advisory Committee of Canada's Munitions and Supply Ministry.

Webb Wilson, formerly an executive of Smith, Barney & Co., New York investment bankers, has been named treasurer of the Fairchild Aviation & Engine Corp. **William H. Schwebel,** formerly secretary-treasurer, will serve as secretary and comptroller.

John C. Enblom of the engineering department, Donaldson Co., Inc., has been made first vice-president and acting general manager. R. H. Donaldson has resigned from active participation in the business and has become chairman of the board of directors.

Ned H. Dearborn, of New York City, has been named executive vice-president and managing director of the National Safety Council. He succeeds W. H. Cameron, who is retiring after almost 30 years as managing director of the Council.

R. E. Van Akin, staffman in the service department of Goodyear Tire and Rubber Co., Akron, has been appointed manager of repair materials sales department, following the resignation of Walter Winius. Succeeding Mr. Van Akin as staffman in the service department will be D. D. Copeland, former Cleveland district service representative.

W. N. Wood has been appointed plant manager of the American Propeller Corp., Toledo, Ohio. He succeeds Wayne Eddy, who has resigned.

James F. McNamara, mill products sales manager of The International Nickel Co., has been made chairman of the board of directors of Harvill Aircraft Diecasting Corp.

Col. Victor E. Bertrandias, vice-president, Douglas Aircraft Co., Santa Monica, Calif., has entered the United States Army Air Forces.

Paul L. Hexter, vice-president of The Arco Co., has received a commission as a captain in the Army Air Forces.

W. M. Packer, vice-president of distribution of Packard Motor Car Co., has been assigned to liaison work between the aircraft engine division and the Army Air Forces on engineering, flight command, field maintenance, and service. Packer holds a commercial flying license. **Lyman W. Slack,** assistant sales manger, has been named acting general sales manager. **R. W. Carson,** assistant sales manager, will assist Vice-president J. H. Marks on aircraft engine contracts.

Earl McGinnis, advertising manager of AC Spark Plug Division of General Motors, has been appointed coordinator of war products and will direct the new AC service and maintenance school in Flint.

P. C. Sowersby, formerly assistant advertising manager for the General Electric Lamp Dept. at Nela Park, Cleveland, has been transferred to Detroit, where he will specialize in industrial lighting designed to increase war production.

Richard W. Millar has resigned as president and a director of Vultee Aircraft, Inc. and as a director of Consolidated Aircraft Corp.. **Don I. Carroll** has resigned as vice-president in charge of production at Vultee.

Donald W. Douglas, president of Douglas Aircraft Co., Inc., has been elected president of the Aircraft War Production Council, Inc., succeeding Richard W. Millar, who resigned. **Harry Woodhead,** president of Consolidated Aircraft Corp., has been elected vice-president of the council, succeeding Douglas.

Arnold F. Van Pelt, formerly assistant general manager of the tire division, will head a newly formed department of business research at U. S. Rubber Co.

Robert H. Pyle has been appointed district representative for The McKenna Metals Co.

Herman K. Eckert, plant manager of the Nitro, W. Va., plant of the organic Chemicals Division of Monsanto has been appointed plant manager and **Dr. Charles S. Comstock** of the production staff of the Merrimac Division at Everett, Mass., production superintendent of the synthetic rubber raw material plant which Monsanto is constructing for the Rubber Reserve Corp., at Texas City, Texas.

F. J. Flammang and **R. W. Spencer** of Sterling Aluminum Products, Inc. of St. Louis, were appointed as senior consultants by the War Department in the Quartermaster Corps.

Fred C. Tucker and **R. E. Larson,** field representatives of the tire engineering and service dept. of the U. S. Rubber Co. have been made chief tire inspectors for the Army Quartermaster Corps. Tucker is at the 8th Corps Area, with headquarters at San Antonio, Texas and Larson with the 9th Corps Area, with headquarters at Salt Lake City.

Robert Borchedt, formerly manager of the airplane section of the contract division at Bell Aircraft, has been appointed sales manager at Arens Controls, Inc. A western sales office opened by Arens at Burbank, Calif., is represented by **W. W. White.**

Philip F. Smith, secretary of The Osborn Mfg. Co. has been appointed as senior priority specialist in the Special Industrial Machinery Branch of the WPB.

Seward A. Covert has been appointed assistant to the president in charge of public relations and industrial publicity at Ohio Crankshaft. He formerly served as public relations counselor for that company while associated with Graves, Taylor & Associates of Cleveland.

John W. Livingston, who resigned as vice-president and member of the board of directors of Monsanto and as general manager of its Organic Chemicals Division, has been released by the Monsanto Chemical Co. to join the Rubber Reserve Co. as consulting engineer. **Julius A. Berninghaus,** general manager of sales of the Organic Chemicals Division, has been promoted to general manager of the division, succeeding Mr. Livingston.

S. K. Towson has been elected president and general manager of the Elwell-Parker Electric Co. and **W. A. Meddick** vice-president.

George C. Cudhea, a member of the engineering staff, has been named to the new position of executive engineer for Fleetwings, Inc.

William W. Miller has joined the executive staff of Stewart-Warner Corp. as head of the legal department.

Otto L. Beiswenger has been appointed manager of the engineering staff of Goodyear Tire & Rubber Co., succeeding Henry G. Schmidt.

J. D. O'Brien, formerly production manager, has been named general manager of the Inland Mfg. Division of General Motors Corp., succeeding **Wallace S. Whittaker,** who is on leave of absence as a major in the U. S. Army. **C. S. Swayze,** formerly general manager of the Delco Radio Division, Kokomo, Ind., has been appointed assistant to **L. C. Goad,** general manager of the Eastern Aircraft Division, Linden, N. J. **Berry W. Cooper,** formerly comptroller of the Delco-Remy Division and the Delco Radio Division, succeeds Swayze as general manager of the Delco Radio Division.

W. R. Dewey, plant manager, and **R. E. Spokes,** technical director, have been elected vice presidents of American Brakeblok Division of the American Brake Shoe & Foundry Co.

J. Lawrence Kilduff, formerly with the Federal Reserve Bank of New York, has joined the Matam Corp., Brooklyn, N. Y., as vice president.

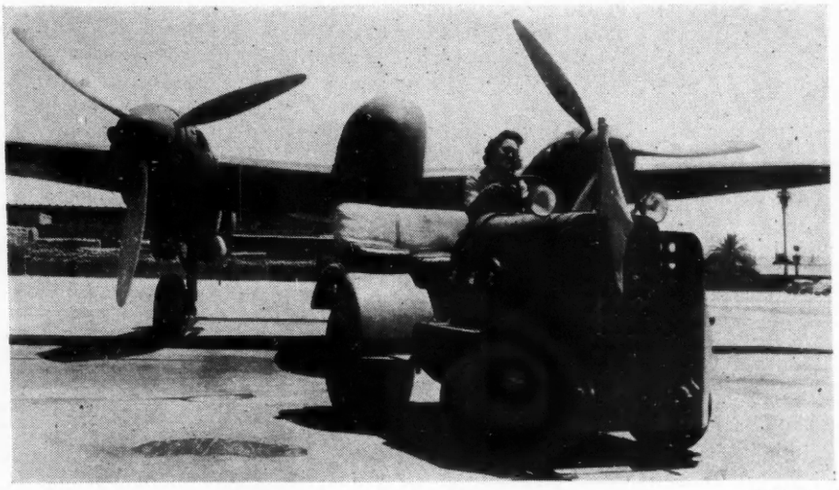
William B. Griese, formerly plant manager of the Lycoming Division of The Aviation Corp., has been made plant manager of the company's new Liquid Cooled Engine Division, now under construction in Ohio. He will be succeeded at Lycoming by **M. I. Bradley,** works manager.

40 YEARS AGO

The price of all commodities has shown an upward tendency in recent years, but there is probably no parallel to the enormous advance in the price of gasoline. In 1899 gasoline suitable for internal combustion engines sold for 7 cents a gallon while now the retail price is 18 to 20 cents . . . The chief cause for this enormous rise in price is undoubtedly the great increase in the demand for this fuel. It is quite certain that the use of liquid fuel will still be largely extended in the next few years, and as it will be impossible to increase the supply in proportion to the demand the price of gasoline may be expected to go up until a satisfactory substitute is found.

The day of a general application of kerosene burners seems to be in sight.

From the *Horseless Age,* August 13, 1902.



Wide World

Mechanical Shepherd Dog

To tow planes into position, the U. S. Army Air Forces rely on this type of tractor which is being driven here by a young lass who has taken over a man's job at a California air base. The plane in the photograph is a Lockheed P-38.

A-1-a Priority for Replacement Parts

Amendment to Limitation Order Permits Producers to Disregard Lower Ratings, Relaxes Worn-parts Clause

All functional replacement parts for motor vehicles were given A-1-a priority under an amendment to Limitation Order 158 issued Aug. 1 by the Automotive Branch of the War Production Board. Previously, the Production Requirements Section could give up to an A-1-a rating to such parts production, depending upon the urgency of need. The new order appears to recognize the necessity of keeping the nation's motor transportation pool in operation in order that the war effort will not suffer. Thus, by placing an A-1-a preference rating on replacement parts, their manufacture should be expedited, provided materials are available. The tight material situation especially relative to alloy steel makes it improbable that some critical materials can be obtained for replacement parts, even on an A-1-a rating.

The amendment to the order reads, "Producers of replacement parts under the terms of this order may, notwithstanding the provisions of Priorities Regulation No. 1 (part 944) schedule their production of replacement parts without regard to purchase orders or contracts placed with them for other material on ratings lower than A-1-a."

Manufacturers who already have made their quarterly applications for material on PD-25-a forms may file emergency PD-25-f applications for material under the new A-1-a provision if the material is urgently needed for replacement parts.

The amendment also relaxes the L-158 provision that required the turning in of a worn part by the consumer in order to receive a new part. A producer or distributor now may sell and deliver a replacement part to a consumer without exchange of the worn part provided the consumer signs a certificate stating that the part to be bought is essential, that it will be used to replace a part that cannot be reconditioned, and that the worn part will be disposed of within 30 days through scrap channels. If the producer or distributor does the replacement work, the worn part must be turned in. The certificate must be retained by the producer or distributor as part of his sales record. This amendment will facilitate the repair of vehicles disabled on the road by not requiring return of the worn part before the new part can be sold. It also will make it possible to replace a hub cap or muffler that may be lost or stolen.

Added to Eligible List

Persons needing new cars for experimental purposes related to the war effort or who plan to rebuild them for purposes approved by the OPA have been added to the list of eligibles in the rationing regulations.

Two groups of buyers are affected by this change: Experimenters using new cars to test synthetic rubber tires, and automobile body rebuilders who are working on plans to rebuild new passenger cars so that they will carry ten or more passengers.

The provisions are contained in Amendment No. 10 to the New Passenger Automobile Rationing Regulations which became effective Aug. 7.

CENSORED

An exclusive feature prepared by M. W. Bourdon, special correspondent of Automotive *and* Aviation Industries in Great Britain.

Many of the tens of thousands of owners of cars laid up since June 30 owing to the discontinuance of the basic gasoline ration are in a predicament, for the garages where their cars have been kept hitherto while in use are now required for repair work and other purposes, and the owners have been ordered to take their cars elsewhere; but they cannot find permanent accommodation and the Royal Automobile Club, on their behalf, is appealing for information as to available storage space.

* * *

New powers conferred on the Minister of War Transport enable him to order bus and truck operators to convert some or all of their vehicles to producer gas propulsion and compel them to make any alterations or additions to the vehicles which he considers necessary to save fuel or increase carrying capacity. He may also specify the make and model of gas producer plant to be adopted in each case.

* * *

Although producer gas is generally regarded as a fuel desirable only to make good the war-time shortages of liquid fuels, there are exceptions. Thus, one of the biggest provincial bus operating concerns—Tillings—expects to continue with producer gas on some routes after the war. Another case is that of a large brewery company, which, after two years' experience with this fuel, has determined to use it permanently for an increasing number of its fleet; economy is the reason, even though it is found that cylinders need reboring after 40,000 miles on the average against 75,000-80,000 with gasoline as fuel.

* * *

The Minister of Supply has decided not to encourage the manufacture of synthetic rubber on a large scale in England. Questioned in Parliament, he said that large quantities of synthetic rubber were being made in U. S. A. where the raw materials were readily available, and that the importation of such materials for large-scale production in England would impose a heavy additional burden on shipping resources. He added that a synthetic rubber committee was keeping the matter under review and that steps had been taken for the production here of substantial quantities of rubber substitute material.

* * *

In addressing a conference of garage proprietors and bus and truck operators, F. G. Smith, repairs adviser to the Ministry of War Transport (himself a garage proprietor normally) urged the more extensive use of female labour and said the work that women were doing in many repairshops was a revelation; in one London depot, he went on, 160 women and eight men were dismantling, renovating and reassembling fifteen heavy truck chassis every week. It was absurd to say that women could not do such work.

* * *

The National Budget for the current financial year (ending April, 1943) anticipates a reduction of 4½ millions sterling in the revenue from motor vehicle taxes, which in 1941-42 yielded £37,422,000. The reduction is expected owing to the laying-up of a great many additional cars after the basic gasoline ration went into effect on June 30th.

"MAN-HOURS"

—the misleading measure of production

It requires but one eye to see that man-hours alone are no measure of production. The thing that counts is how much that man can produce in one hour.

ALTER EGO: Sure. By one method he may produce two or three times as much per hour as by another method.

Take arc welding. This method results in far greater effectiveness. In joining steel, one welder does the work of two, three or four men using other methods. And he does a better job with 15% to 25% less steel.

ALTER EGO: Then it would seem a better measure for a company's contribution to the war effort would be METHOD-HOURS.

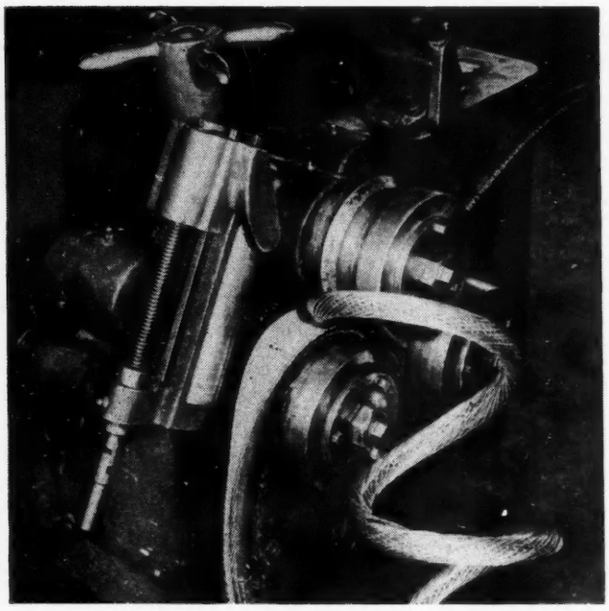
True as gospel. Our whole war production has been zoomed by those who grabbed arc welding as the only way to save our national neck.

ALTER EGO: And later they'll be schooled in an art to save their individual necks when competitive production again seeks profitable markets.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

then I said to myself—
IT'S METHOD-HOURS THAT COUNT!



No-waste Salvage

The Timken Roller Bearing Co., Canton, Ohio, has converted these bending rolls into a cable-stripping unit by removing two of the rolls and substituting a notched feeder roll at the bottom, a slitting roll at the top. Fed into the machine at the rate of 6 fpm, the cable is neatly shorn of its rubber insulation and outside cotton braid which falls free of the insulation.

Complete New Standard

The American Standards Association has announced completion of another American War Standard—Machine Tool Electrical Standards.

Proposals for this work were brought to the ASA by the National Machine Tool Builders' Association. Its purpose is to speed the manufacture of machine tools by standardizing the electrical wiring of such tools. The standard has already been made mandatory by War Production Board Order L-147, which limits the future electrification of machine tools to the types of equipment recommended in the American War Standard.

Absenteeism Drops

An "Alternating Swing Shift" that requires 28 men for every 24 jobs has resulted in a 75 per cent reduction in week-end absenteeism at Ohio Crankshaft, Inc., Cleveland.

Providing every war worker in the aviation division with one full day of rest a week, the "shift" extends through a cycle of seven weeks and then repeats. Production in the plant has not suffered by the new plan.

Eugene B. Clark

Eugene B. Clark, 69, president of the Clark Equipment Co., died July 29 in Chicago. He also was president of the American Ore Reclamation Co., the American Sintering Co., and the Buffalo Sintering Co.

Philo D. Bates

Philo D. Bates, founder and president of the Bates Mfg. Co., Ridgetown, Ont., died suddenly Aug. 3 while on a fishing trip in Northern Ontario. He was at one time purchasing agent for the Maxwell-Chalmers Co. and one of the founders of the Hutto Engineering Co.

BOOKS . . .

FATIGUE OF METALS—SOME FACTS FOR THE DESIGNING ENGINEER, *by D. Landau. Published by the Nitralloy Corporation, New York, N. Y.*

During the past two or three decades a great deal of research has been devoted to fatigue phenomena in metals, and many articles on the subject have appeared in the periodical press and in the transactions of engineering societies.

Mr. Landau in his pamphlet deals with the subject of fatigue in a systematic manner, on the basis of the published literature. He gives clear explanations of the various special terms used and discusses the implications of fatigue phenomena from the standpoint of the mechanical designer. An Appendix describes and illustrates various fatigue-testing machines and is followed by an extensive bibliography.

* * *

RATIONED RUBBER & WHAT TO DO ABOUT IT, *by William Haynes and Ernst A. Hauser. Published by Alfred A. Knopf, New York.*

The story of rubber, including that of wild rubber from the jungles of Brazil, and the Belgian Congo, plantation rubber from the Far East, and the synthetic rubber which promises to play a most important role in getting us over our present emergency is interestingly told in the pages of this book. In the first chapter the emergency situation is outlined and a brief account is given of work on synthetic rubber up to our entry into the war.

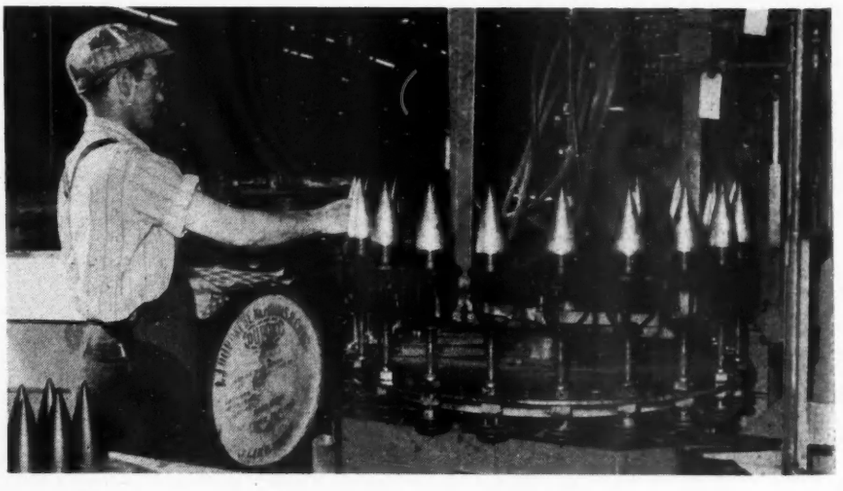
The second chapter deals with the properties of rubber and its various uses, particular emphasis being laid on its use in war equipment. Then follow chapters on Rubber from the Jungles, Plantation Rubber, and Rubber from the Laboratories, which are essentially terse historical reviews of three successive eras of rubber production. In a chapter on Vulcanization and Compounding the history of the industrial uses of rubber is traced. Other chapters are headed Reclaim the Stabilizer, Odd Jobs for Rubber, Natural Rubber Stocks—Today, Synthetic Rubber Supplies—Tomorrow, and How to Conserve Rubber Goods.

The book is evidently written for the general public, but by men familiar with the rubber industry and its history, and we are inclined to think that it will be widely read, because of its timeliness and the information it contains.

* * *

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE, SEVENTH EDITION. *Published by The Lincoln Electric Company, Cleveland, Ohio.*

The new edition, which contains no less than 1308 pages and 1810 illustrations, has been greatly enlarged, and in the selection of new material the authors have made particular efforts to provide up-to-date information on the application of arc welding in the war industries. The book explains the various methods and techniques used in welding, with a view to speeding up welding design and engineering, and to make it easier for the men in training to learn the essentials of welding quickly. More profusely illustrated than in previous editions is the chapter on "Typical Application of Arc Welding." Large numbers of these new applications have been developed during the past year in many fields of war production. New information is included on such subjects as welding symbols; allowable stresses; pre-heating for welding; stress-relieving procedures, speeds, and costs; "Fleet-Fillet" technique; general metallurgical characteristics of metals and alloys; weldability of aluminum alloys; tubular construction; and appearance and styling of welded design.



Armor-piercing Shot

The Chevrolet Motor Division of GM is one of the several units of the corporation now producing armor-piercing shot which, it is said, will penetrate the thick armor of many types of combat vehicles. The tips being painted here are machined from solid bars in shops which formerly produced small parts.

Kanzler Leaves

(*Continued from page* 45)

of democracy mentioned by Kanzler were three of the leading air authorities of the United Nations, Lieut.-Gen. H. H. Arnold, chief of the U. S. Army Air Forces; Maj.-Gen. Alexander I. Belyadv, of Soviet Russia, chief of the Soviet purchasing commission; and Air Marshall B. C. Evill, of Great Britain.

The airmen were shown a new locally controlled ball turret for bombers which is being manufactured in a new plant of the Briggs Mfg. Co. The new plant only was completed May 15 but production is already 53 per cent ahead of schedule. Only about 25 per cent of the machinery has been delivered. A pilot line for the turrets was set up in another Briggs plant last fall and the first turret was delivered to the government Dec. 23. The new turret is installed in the belly of the fuselage and the gunner operates two machine guns. It can be moved vertically or laterally through an arc of 60 degrees by electric motivation. A thick plate glass window and curved plastic windows give the gunner maximum visibility, but he is protected otherwise by armor plate.

Other plants visited by the flying generals included the DeSoto Division of Chrysler Corp. and the Hudson Motor Car Co., where airframe subassemblies for Martin B-25 bombers are being turned out in ever increasing volume. The first orders for this bomber were received June 2, 1941, by the automotive plants. The fuselage has been split in three sections, the tail cone, center bomb-bay, and nose (control and bombardier) sections. Chrysler is producing two sections and Hudson one. Goodyear Aircraft Corp. is producing the tail assembly, engine nacelle sections, and wing tips. All these subassemblies then are shipped to a government-financed plant in the Midwest operated by the Glenn L. Martin Co. for final assembly. Using a former automotive plant of the Graham-Paige Motors Corp., DeSoto Division of Chrysler has set up four main assembly lines for the bomber sections. These are fed by sub-assembly lines feeding across the plant into the main lines. The overhead mono-rail conveyors converge at the ends of two railroad spurs, where the finished sections are rolled directly into automobile freight cars.

Complete drawings of the fuselage sections were not available until last February. And despite the fact that design changes from the prime contractor came in during the tooling up stage at a rate of 500 per week, the first assembled sections were shipped May 15. Now output is regulated only by the ability of the prime contractor to accommodate the finished subassemblies. DeSoto also has been able to so expedite production that it can operate the airframe assembly plant on a one-shift basis instead of two shifts as formerly, using all the personnel from the two shifts, however. Output thus can be stepped up by adding another shift when conditions at the Martin final assembly plant and material shipments warrant.

Simplification of assembly operations and use of the photo-template process for reproducing loft drawings have speeded production. These templates are reproduced on metal in the plant's own photographic department, serving as patterns to guide the workers and inspectors. The two bomber sections assembled at DeSoto contain about 14,000 individual parts, exclusive of rivets, bolts, nuts, and washers. Automotive manufacturing methods have been adapted in the breaking down of the fuselage sections into ever smaller bits and pieces for precision manufacture that insure complete interchangeability. Chrysler engineers give complete credit to the aviation industry for throwing open its plants and methods for study by automotive production men and extending their complete cooperation.

Gen. Arnold also visited the Chrysler Engineering Laboratories during

(*Turn to page* 86, *please*)

SIX THINGS A MAN CAN DO

IMAGINEERING

SO MUCH SO SOON

1 ***MAKE OUR OWN JOB MORE PRODUCTIVE.*** Every man jack of us can. And that's not preaching, either. It's the point of view we've adopted for the duration at Alcoa. The records we've broken so far, we tell ourselves, aren't nearly good enough. Nor shall we be satisfied with the new ones we set tomorrow.

MAKE OUR MACHINES MORE PRODUCTIVE. There is a way. We don't know the answer for your equipment. But we have found the answers for many of our own machines which we thought were already up to top output. The resulting step-up is getting planes into the air faster. And it is doing things to aluminum prices. Designers please note.

III ***PRACTICE PREVENTIVE MAINTENANCE.*** Keeping present equipment in top condition is easier than getting new. One of the ways our engineers are helping production everywhere is in counseling users of aluminum equipment on means of preventing unnecessary corrosion. The remedy is usually simple; the results priceless. Ask us.

FOUR ***BUY WAR BONDS AND STAMPS.*** It's patriotism with self-interest. You finance the war and you help to defeat inflation by refusing to spend for nonessentials. Moreover, you finance yourself to take advantage of all the revolutionary new products that are going to be ready to buy when the war is over. Buy today to keep your own wheels turning tomorrow.

FIVE ***DREAM A DREAM EVERY DAY.*** Remember that the kind of peace we all want depends on how many jobs we think up for the boys coming back. New jobs come out of new things to make. Let your imagination soar; engineer it down to earth; then file the plans away, ready for the day when. That's Imagineering! Selfish suggestion: think seriously in terms of Alcoa Aluminum.

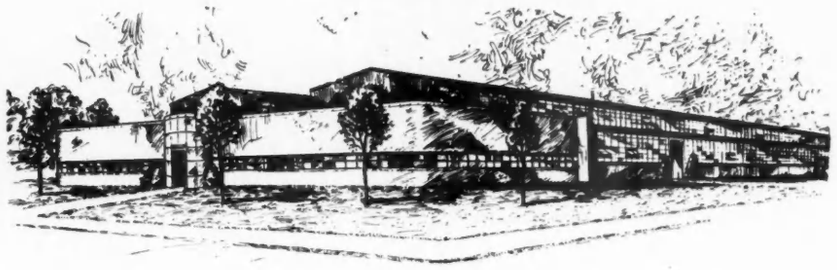
Sixth and last ***KEEP THE OLD CHIN UP.*** Whatever the news, whatever the temptation, keep the chin up. The boys out there deserve it. Whether it's rationing, or restrictions, or whatever, let them watch us being soldiers about that.

Aluminum Company of America, 2110 Gulf Bldg., Pittsburgh, Pa.

ALCOA ALUMINUM

Sciaky Bros.' New Plant

Sciaky Bros., manufacturer of resistance welding machines for spot and seam welding of aluminum and light alloys, recently moved into its new plant located (near the municipal airport) at 4915 West 67th St., Chicago, Ill. The new factory is said to provide ample space for the fabrication of standard machines and the development of others for all weldable materials.



Sun Oil Proposes Gas-saving Scheme

The Sun Oil Co. has suggested that by using only half the cylinders of their automobile engines owners can cut fuel consumption approximately one-third and still obtain "reasonably satisfactory" operation.

In the announcement it is stated that "comprehensive tests have proved that it is practical to run most automobiles—and still obtain smooth, adequate and reasonably satisfactory transportation—by using only half the number of cylinders and making simple, inexpensive motor and carburetor adjustments."

A similar suggestion was made by the editors of *Motor Age*, another Chilton publication, in one of their recent issues.

Shift Transport Service

(*Continued from page* 48)

cles used as plant equipment at manufacturing arsenals, proving grounds, depots, and airdromes.

All divisional quartermaster battalions, less their automotive units, will remain in the Quartermaster Corps. So will all quartermaster services, minus automotive maintenance and depot units, that are now allocated to corps, army, general headquarters troops or service commands. The Quartermaster Corps will concentrate on the feeding and clothing of troops now that it has been divorced from motor transport activity.

The engineering and testing divisions of the Quartermaster Corps, now under Ordnance direction, probably will remain at Camp Holabird, Md. The vehicle, procurement, hand tool and equipment and spare parts distribution sections have been moved from Camp Holabird to Detroit in the last few months.

The new Ordnance Combat-Automotive Center also will absorb most of the personnel of the Detroit Ordnance District, which is under the command of Col. A. B. Quinton, Jr.

The absorption of the Motor Transport Service by the Ordnance Dept. is expected to be completed by Sept. 1.

For EASY RESETTING ACCURATE TIMING DEPENDABLE WELDS—

Control of time duration is provided in two indexed control dials···the top one is a coarse adjustment···the lower, a fine adjustment.

To set the time for 15 cycles, set the upper dial at 10, and the lower at 5. It's just as simple as that!

Time settings from 2 to 30 cycles, based on a 60 cycle circuit, adjustable in 30 steps, are provided···there's no fumbling nor guesswork, in re-setting to previously established time periods. The indexed dials insure accuracy.

There's only one moving part···the moving arm in the relay. This arm is made of berylium copper···one of the most fatigue-resisting metals.

The relay contacts are made of a special alloy···giving five times the service usually found in relays of this type.

All other devices are not movable···are not affected by frequency of operation.

A GOOD COMBINATION FOR PRODUCTION —
"3C" Bulletin 7744 Weldmaster Timer and Bulletin 7740 Welding Contactor

FOR YOUR CLOSER INSPECTION

Type 1 Timers are for use on manual, air, or motor operated welders with Maintained Contact Type Initiating Switch. The NON-REPEAT, but not the NON-BEAT feature is included in Type 1.

Accurate, uniform welds, under the same conditions are assured on repeated welding operations.

Also shown in the lower left corner is a "3C" Bulletin 7740 A. C. Magnetic High Speed Welding Contactor. It meets extreme, exacting service conditions in resistance welding applications.

For complete details ask for Bulletin 7744 Weldmaster Timer···Bulletin 7740 A. C. Welding Contactor.

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

UAW-CIO

(*Continued from page* 47)

division. Organizational expense in the aircraft industry totaled $342,750, much of it for the intensive drive directed by Richard T. Frankensteen. Nearly 44 per cent of the general fund, or about $1,270,000, was expended in organizing drives.

Despite Addes' plea for increasing monthly dues from $1 to $1.50, the convention turned down the proposal. On this subject, Addes said, "Statistics show that members of the UAW-CIO receive the highest hourly rate in any large industry in America and that for the privilege of belonging to a union that has accomplished so much, the dues are as low as that of any union in America. . . ." Addes reported a balance of $917,190 in the union treasury but sought the building up of a post-war reserve fund.

In a turbulent convention marked by the unwillingness of the delegates to follow the recommendations of the officers, the UAW-CIO adopted a resolution calling for the government to require the rest of labor to drop premium pay for week-end work when it comes within the five-day week within 30 days or the UAW will reopen all its contracts to have the premium pay reinstated. The union relinquished premium pay last April at an emergency war conference in Detroit after a plea by President Roosevelt. Addes estimated that 75 per cent of the plants with UAW contracts had put the premium pay waiver into effect. Delegates were irked because in two recent NLRB elections which the UAW lost, at the Vickers plant in Detroit and the Curtiss Aeroplane Division in Buffalo, the opposition had told workers that they would lose weekend premium pay if they voted UAW-CIO. Several AFL unions have opposed waiver of premium weekend pay until their contracts expire.

The 1800 convention delegates voted down a proposal to defer the next union convention and election until May, 1944, on account of the war, but approved the creation of two vice presidencies.

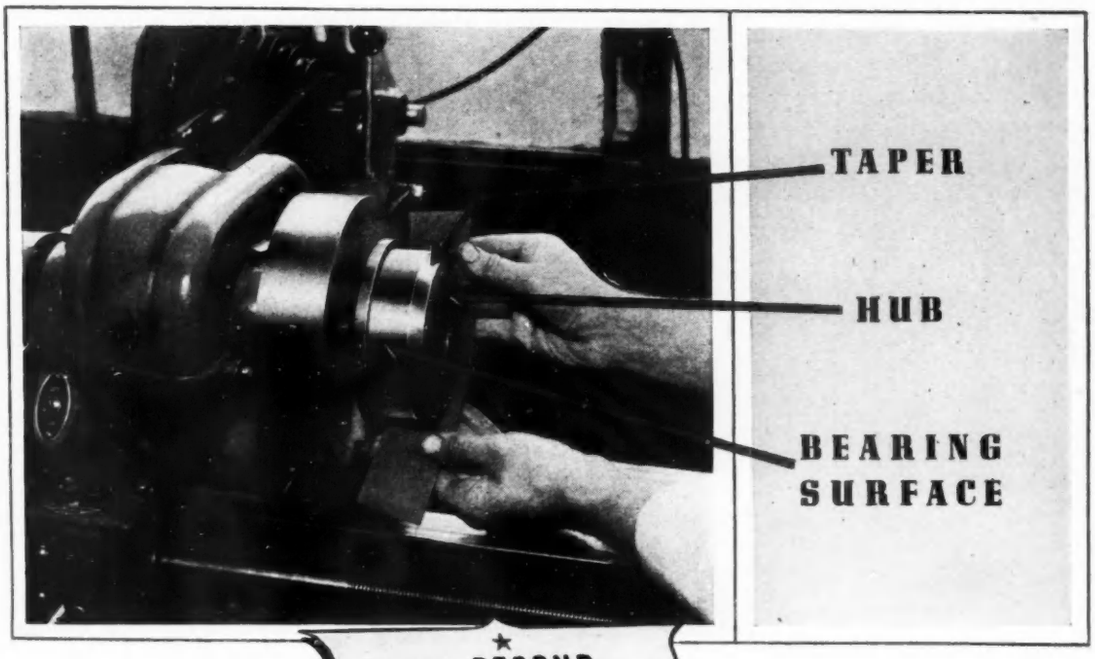
In an NLRB election at the new Fisher Body tank plant near Flint, which was shut down for a week in a recent labor dispute, the UAW-CIO received 1001 votes to 146 for the UAW-AFL and 11 for no union. In another election at the Fairchaft Aircraft Division of Fairchild Engine & Airplane Corp., Hagerstown, Md., the UAW-CIO received 3065 votes, or 80 per cent of those cast. The AFL polled 262 votes, while 528 voted for no union. A contract signed with the Studebaker Corp. Aviation Division provides for any wage increases that are granted to GM workers by the WLB, such increases to be retroactive to May 20.

Hearings by the special WLB panels in the Ford and Chrysler cases adjourned for a week during the UAW-CIO convention to allow the labor representatives to attend. After a week of hearings transferred from Washington to Detroit, it was announced that the present Ford contract had been extended to Aug. 31.

A jurisdictional dispute between the CIO and the AFL over the organization of clerks in independent groceries at Pontiac, Mich., had extraordinary ramifications, July 31, when it resulted in the closing of the Pontiac Motor Division of GM, producing naval ordnance and diesel engine parts, thus making 7600 war workers on two shifts idle. CIO grocery clerks picketed the Pontiac Motor plants to call attention to their fight with the rival AFL and sympathetic UAW-CIO members refused to cross the picket lines. C. E. Wilson, president of GM, called the strike a "national disgrace." His wire of protest to Thomas brought orders from the international union to the local to resume work. Fifteen Pontiac employes were suspended by the management for marching in the grocery clerk picket lines. Appointment of a Detroit attorney as arbitrator by Gov. Van Wagoner brought an end to the clerks' picketing and work was resumed.

Oil Seals • Dirt Seals • Grease Seals

SERVE BEST WHEN PROPERLY INSTALLED



THE SECOND IN A SERIES OF MESSAGES TO HELP THOSE ON THE INDUSTRIAL FRONT RESPONSIBLE FOR BETTER BEARING PERFORMANCE

The spring-loaded leather or synthetic rubber wiping lip of an oil seal is constructed very carefully because the effectiveness of the seal in service depends largely on how this lip functions.

If the shaft over which the seal is installed is rough, its rotation in service, particularly at high speeds, will rapidly wear away the smooth inner bearing surface of the wiping lip of the seal and thus destroy its initial effectiveness. Consequently, it is highly desirable to polish the shaft or hub on which the seal bears. This applies even to ground shafts and especially those which display spiral tool or grinding wheel marks.

Both grinding and polishing should be done radially to avoid any possibility of spiraling. The polishing of the bearing surface should be done if possible on a lathe for maximum uniformity. After polishing, the shaft should be wiped perfectly clean and lubricated with clean lubricant before it is assembled through the seal.

Any questions you may have relative to seals will be promptly answered by Chicago Rawhide engineers.

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Exclusively and now Sirvene Synthetic Products

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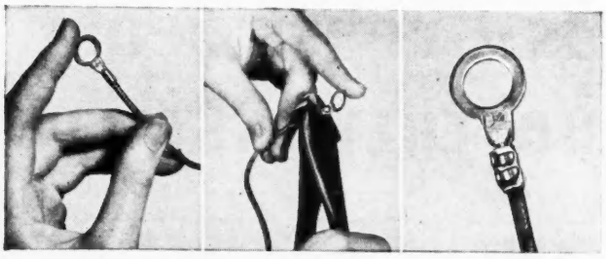
MEN and MACHINES

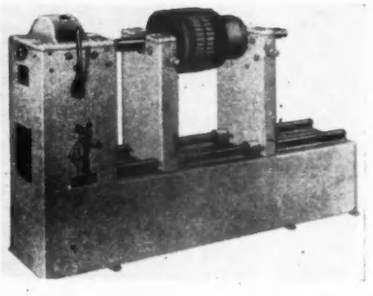
(*Continued from page* 44)



This electro-tinned terminal made from soft-annealed copper is typical of the many terminals manufactured by Aircraft - Marine Products, Inc.

A COMPLETE line of over 300 different solderless wiring terminals, connectors, contacts, plugs, bonding jumpers, etc., for many wire sizes are carried in the stock of Aircraft-Marine Products, Inc., Elizabeth, N. J. Installation of the terminals is effected by crimping the terminal barrel onto the wire end with a hand-, bench-, or floor-type crimper.

A FLOOR-TYPE industrial balancing machine, Model 370, manufactured by the Bear Mfg. Co., Industrial Division, Rock Island, Ill., is available in three lengths. The largest machine of the series, designed to handle shafts up



Bear Model 370 industrial balancing machine for checking static and dynamic balance of rotating parts weighing up to 1000 lb.

to 3 in. in diameter, will accommodate armatures, blower wheels, etc., weighing up to 1000 lb. Other models for parts weighing as little as 1 lb. are available.

A NEW tube-cutting attachment which can be adapted to all sizes of Campbell nibblers is said to contribute to the speedy and efficient cut-

(*Turn to page* 64, *please*)

This tube-cutting attachment can be adapted for use on all models of the Campbell nibbler.

ARE YOU GETTING *Maximum Service* FROM YOUR VISUAL GAGES?

1 Equipped with plain and serrated anvil for the checking of width, thickness, height, or outside diameter.

2 Equipped with flat anvil and thread wire attachment for checking pitch diameter of screw threads.

3 Equipped with standard backstop for accurate and rapid positioning of work being gaged.

4 Equipped with wide anvil and Sheffield sine bar fixture for the checking of tapers.

5 Equipped with Sheffield Internalgage for the checking of inside diameter, taper, and out-of-round.

6 Equipped with wide anvil and V-block for checking outside diameter of cylinders and bushings.

7 Equipped with fixture to check ball diameter of an inner ball race.

8 Internalgage with fixture to check a depth.

The Sheffield Visual Gage is used for many purposes. If you are not familiar with all of them, the outline here may suggest a means of increasing the effectiveness of your gages and the variety of work they do.

Sheffield Visual Gages are used:

In the Inspection Department

For the final inspection of close tolerance manufactured parts.

For the classification of such parts as the basis for selective assembly.

In the Tool Room

To check fixed size gages for wear.

To check precision gage blocks for wear.

To check the dimensional accuracy of tools.

In the Production Shop

To provide machine operators with an accurate check on work in process.

In the Receiving Department

To check dimensional accuracy of purchased parts and sub-assemblies on arrival.

In the Laboratory

To provide maximum accuracy for measurements of all kinds.

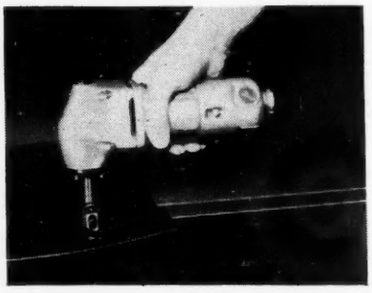
THE SHEFFIELD CORPORATION

DAYTON, OHIO, U. S. A.

(*Continued from page* 62)
ting of a wide range of materials. The attachment is manufactured by the Andrew C. Campbell Division of the American Chain & Cable Co., Inc., Bridgeport, Conn.

TO IMPROVE their operating characteristics and increase their ease of handling, both the 16- and 18-gage Lectro-Shears, built by the Black & Decker Mfg. Co., Towson, Md., have been redesigned.

The No. 18 shear has been reduced in outside dimensions so that the motor housing forms a convenient handle.



These Black & Decker electrically operated cutting shears have been redesigned for easier handling and control.

This change is said to provide better operating balance and control.

The No. 16 Lectro-Shear has been equipped with an improved operating handle which, in addition to better balance, gives better control on curved and irregular lines. It is fitted with an instant-release trigger switch incorporating a locking pin for continuous operation.

THE Racine Oil-Cut hydraulic metal cutting machine, built by the Racine Tool & Machine Co., Racine, Wis., provides a sensitive hydraulic feed for cutting thin-walled tubing or solid-steel stock. Equipped with a three-speed sliding-gear transmission, the machine can be operated at cutting speeds of 70, 100, or 140 strokes per minute.

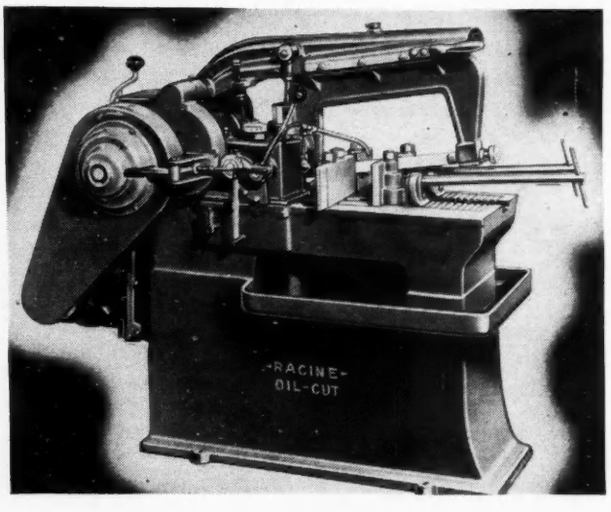
The self-contained hydraulic system, set by two dials, controls the rate and pressure of feed; a single lever controls the clutch. The machine, which is designed to cut 6-by-6-in. stock, can be furnished as a belt- or motor-driven model.

TWO new types of sealing compounds, especially developed to seal plywood tanks against aromatic fuels, are being manufactured by Prestite Engineering Co., St. Louis, Mo. One type can be brushed, sprayed, or slushed on at temperatures down to —70 F; the other, used for sealing flange fittings, is compounded to be brushed on.

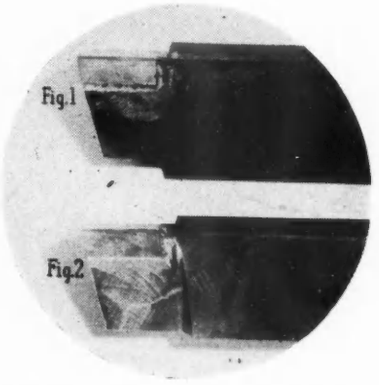
TO MEET the growing war needs of powdered metal industry, the Kux Machine Co., Chicago, Ill., has introduced a new automatic press, Model 74, which is designed to handle powdered metals and ceramic materials. Completely automatic in operation, the machine requires only an occasional filling of the hopper containing the powdered raw material. It can apply up to 50 tons total pressure to form parts up to 5 in. in diameter.

The Kux Model 74 automatic press, designed to handle powdered metal and ceramics, produces a total maximum pressure of 50 tons.

The machine is built around a cast-steel frame and weighs approximately 13,500 lb.



Racine Oil-Cut hydraulic cutting machine.



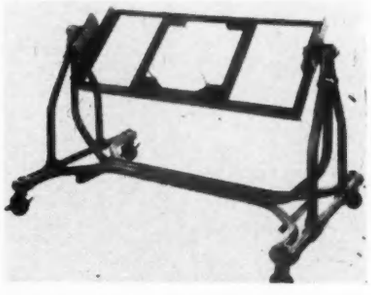
By the use of "Fluxined-Spelter" produced by Krembs and Co., Chicago, Ill., a purportedly perfect bond between a carbide cutting tip and a tool shank can be obtained. Although there are several methods of using the new product, the simplest involves brushing the compound onto the contacting surfaces, assembling the tip and shank, and then heating to bond the two pieces.

A NEW product said to extinguish a magnesium fire, instead of merely confining it, has been announced by Waverly Petroleum Products Co., Philadelphia, Pa. Known as "Speedi-Out," the product is a hard coal tar pitch which can be shovelled onto the fire. Upon hardening it can be easily chipped off. It is packed in 100-lb. burlap bags.

A NEW Clayborne engine assembly stand has been developed by Motor Rebuilding Specialties, Chicago, Ill., for use with the W670 Continental engine. With slight variations it is adaptable for radial-opposed and in-line type of engines weighing less than 1000 lb. The frame, made of welded tube steel, follows the usual Clayborne construction.

A mounted engine can be rotated

(*Turn to page* 67, *please*)

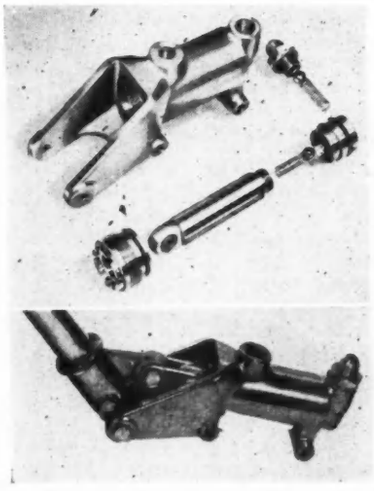


Clayborne engine assembly stand for model W670 Continental engine.

(*Continued from page* 64)

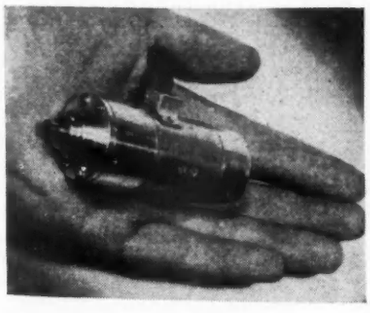
360 degrees and can be positioned and locked at 30-degree intervals. Drip or chip pan slides are welded across the bottom of the frame. The stand is fitted with swivel casters, two of which have locking devices to prevent rolling.

THREE models of a new hydraulic hand pump, each with a 1½-cu-in. displacement, are now being produced by the Hydraulic Division of the Harvill Aircraft Die Casting Corp., Los Angeles, Cal. The pumps, which conform to the SAE aeronautical standards, consist, in part, of a pressure-molded pump body and fulcrum. The use of only 13 parts in the construction of each pump is said to contribute to the reliability of the product.



This Harvill hydraulic hand pump, one model of three in the 66-2000 Series, is available with mounting pads and port openings built to the customer's specifications.

THE TOBE Filterette, a compact, efficient unit for filtering radio noise set up by electrical interference, has been perfected by the Tobe Deutschmann Corp., Canton, Mass. in collaboration with the U. S. Signal Corps Laboratories at Fort Monmouth. The filter system is designed for use on Army vehicles and small Naval vessels.



General Electric aircraft motor, Type BA-10, with internal gear reduction.

Designed to keep tools right on the job, this Penco "3-shift" tool stand, manufactured by the Penn Metal Corporation of Penna., Philadelphia, Pa., is equipped with three separately-locked drawers which are 18 in. wide, 16 in. deep, and 5 in. high. The complete stand is 30 in. wide, 18 in. deep, and 32 in. high.

Tooling for Plastic-Bonded Aircraft

(*Continued from page* 34)

of toe-nailing of the bulkheads in the vertical position.

The second-stage jig receives the spar with the ribs assembled to it and is located by the holes which were drilled in the first-stage jig. This fixture provides for finishing the ribs to their proper contour and bevel by means of hardened contour blocks which guide the bar for shaping and beveling the stations. It will be seen that this is a comparatively simple jig, comprising a channel-iron base with trunnion mounts at both ends and removable steel contour blocks.

The third assembly jig provides for skinning of the leading-edge section and scarfing of the skin joint, provided they join at the spar. This jig has a channel-type base with trunnion mounts. The spar is raised high enough above the channel to permit scarfing the skin after it is tacked in position. Steel straps faced with rubber exert pressure at the proper surfaces.

The fourth assembly jig is used to assemble the leading edge and the ribs aft of the spar. Skin panels are cut net and scarfed on the edge which joins the edge of the skin already scarfed, on the leading edge of the assembly. The trailing edges are usually trimmed later.

The last-stage jig is of the waffle type and is so built that either leaf may be up, in position to permit contouring and beveling of the ribs after they have been attached to the spar, and yet give them sufficient support. The keepers which locate the ribs in their stations are spring-loaded. When the skin is put on they spring back, as they must not straddle the rib after the skin is on.

Vertical Stabilizer

The fin usually is assembled with the spar finished net. The spar is confined to maintain the hinge line fittings. The leading edge usually is finished net and confined from the aft face, by means of tooling holes which later are plugged.

The assembly jig provides locators for the ribs, the spars, and the leading edge. This fixture usually is of the cradle type and permits skinning of one side only. A fixture of opposite hand, which is nothing more than a cradle, provides for holding the assembly while the remaining half of the skin is attached. Owing to the fact that the ribs are well supported from below, the fairing operation also can be performed in this jig, by the same method as previously described in connection with other assemblies.

Fuselage

The method of fuselage assembly depends a great deal on the manner in which the ship is broken down. If the station rings are full rings, assembly may be accomplished by collapsible arms protruding from a center beam which will locate the stations in their proper relationship. A fixture which will confine the fuselage to the wing attachment fittings and the motor-mount attachment fittings in proper relation to the fuselage lines also is necessary.

If the fuselage is divided through its vertical axis, the assembly procedure is somewhat different from that described previously. The frames then are located in an assembly fixture in proper relation to each other, rotated 90 deg. to the vertical axis. The stations then may be fully contoured or partially contoured to the correct bevel, and then completely faired. Installation of some of the accessories and brackets also may be made at this time. The fuselage is then skinned. At this stage of the assembly the skin already is fabricated to a half-shell or whatever portion of the shell is advisable. The two half shells now are assembled in a fixture which picks up tooling holes on the outside contour of the ship. With an assembly of this type it is considered wise to drill all of the attach-

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in the biggest poker game the world has ever known

THESE are the chips that will win the game of war . . . the chips that curl off the cutting tools of American machines. Pictured below is a hundred-thousandth-of-a-second interval in a normal 24-hour day during the life of a P&W Curvex Cutter . . . milling a recess in an aircraft engine housing. It's sharp, clean cutting, moving fast even though our "frozen-action" camera "stopped" it cold. Those thick, husky teeth are almost new — but they can be reground again and again, down to thin wafers, before their useful life ends. Many hundreds of engines will have felt their precision bite.

That's *service* from cutting tools. It's building American *strength* in the air.

Don't worry about your Pratt & Whitney cutting tools . . . bear down . . . they can take it.

P&W Photo—Unretouched

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

ing holes at this time, including the wing-fitting holes, motor-mount holes, horizontal and vertical stabilizer holes, and any others in strategic locations.

Design of the assembly jib for the fuselage depends a great deal on the scale of production anticipated. It may be either a very simple jig, or it may be a type which will receive the half shell in a horizontal position, locate the assembled half by means of tooling pins in proper relation for assembly to the opposite half, then swing the half shell into the vertical position, and finally bring the halves together on a track. This fixture would have facilities for boring and reaming all strategic holes, and also for facing any surfaces necessary to establish a definite plane. It is believed that by this latter method a much higher rate of production can be obtained.

Fuselage shells have been fabricated by several different methods, each of which has its particular virtues. One method makes use of a concrete female form into which the laminated strips are laid, both longitudinal and lateral. With all of the laminations in place, the pressure bag is laid on top of them, a cover is put on the form, and the bag is inflated.

Another method is the exact opposite of the one just described. The material is laid on a form, a rubber envelope is slipped over the material and form, and air is pumped out of the envelope, thereby causing the material of the envelope to be pressed against the form. The assembly then is placed in a pressure chamber to which steam is admitted to furnish additional pressure and the heat necessary to set the bonding material.

Leading Edges and Fairings

Leading edges, fairings and other parts having surfaces that are difficult to form, also have been formed by several different methods. One makes use of steam heat, the steam being admitted into a male or female block over which the part is laid and then confined by a hinged cover. Some of these have worked very satisfactorily with the use of cerromatrix to ensure proper curvature of the tool.

Another successful method consists in laying the material over the form and then covering it with a blanket. The whole unit then is placed in a steam chamber, and the steam pressure in the chamber is raised to the required point.

Still another method, which also has worked successfully, involves the use of kirksite cast forms which are cored out to allow hot oil to circulate through them. The part is laid over the outside of the form and pressed against its surface by a mating form. Ribs and small assemblies are cut, routed and fabricated in hot presses in two minutes.

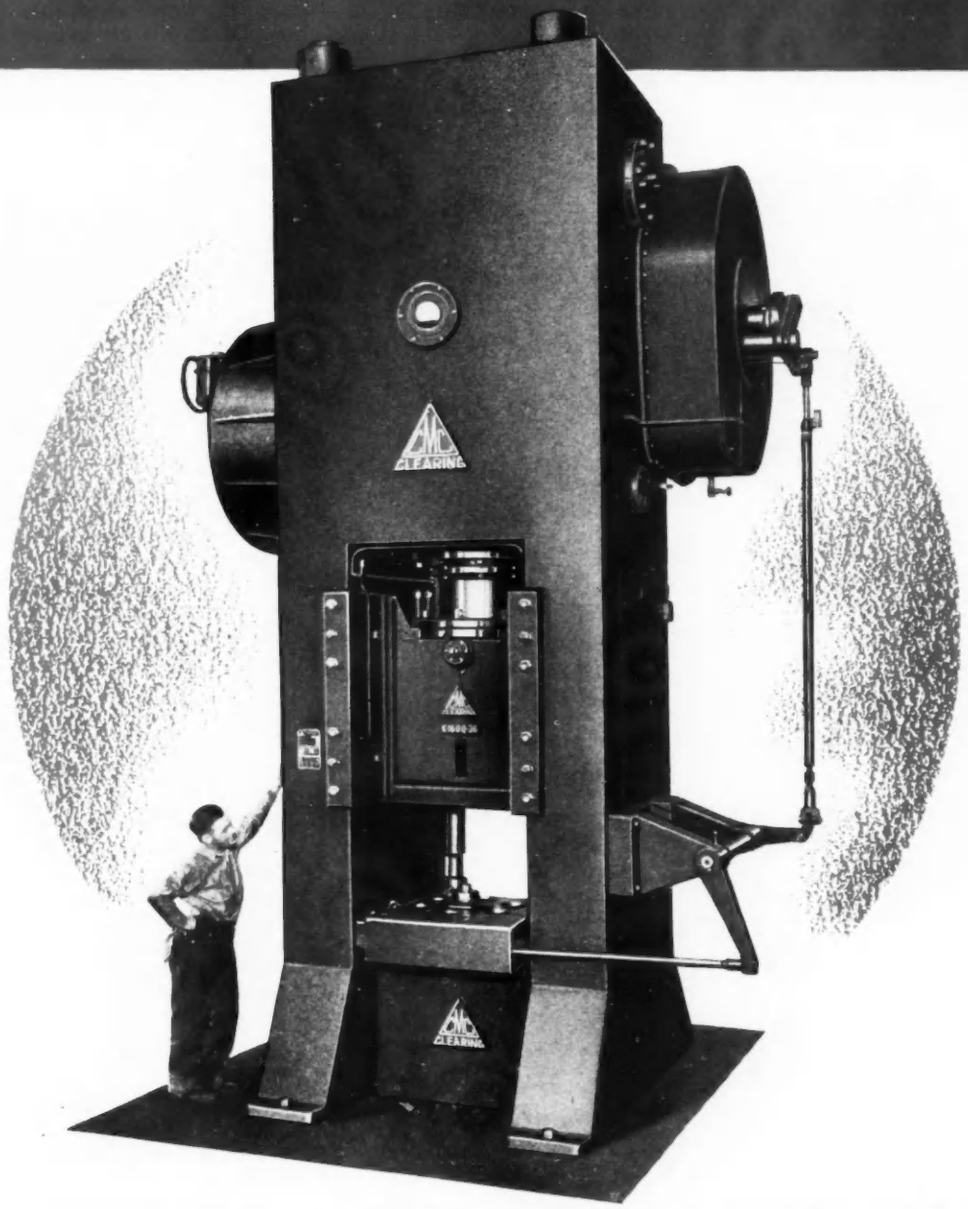
Wing Nuts on Channel Strip

Consisting of Boots sheet metal wing nuts in combination with a channel strip, the Boots curved channel is available in standard semi-circles with radii ranging from 2⅜ to 11¾ in. Although the standard model is furnished with regularly spaced nuts, the channel can be supplied with nuts spaced according to the customer's specifications. The unit is manufactured by the Boots Aircraft Nut Corp., New Canaan, Conn.

"No Freeze"

"NO-FREEZE," manufactured by the Great Northern Chemical Co., Oak Park, Ill., is a permanent type anti-freeze which is said to contain no critical materials. The manufacturer guarantees the product against freezing down to —35 F; to prevent rusting of any part of the cooling system; to be harmless to the engine, car, finish, or person; and not to boil off or evaporate (boiling point: 324 F). It is said to contain no acid, calcium chloride, sodium chloride, or other inorganic salts.

SAVE VALUABLE PRODUCTION TIME



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THE continuous operation of this 600 ton CLEARING Knuckle Joint Mechanical Press is all important. Repairs must be minimized. Included in the design of this press are many safeguards from repairs, a few of which are all welded steel frame, slide doubly guided in crown and gibs, all rotating parts running in a bath of oil, and improved type of solenoid valve controlled air clutch and brake that prevents slipping, heating and excessive wear on the linings.

Equally important, this press must meet the exacting requirements necessary for heading and indenting 37 mm. cartridge cases.

Dependability, accuracy of design, and speed in production are a constant in CLEARING Presses.

Clearing Machine Corporation
6499 West 65th Street, Chicago, Illinois

MECHANICAL AND HYDRAULIC PRESSES

CLEARING

MACHINE CORPORATION

CHICAGO

Russian Military Aircraft

(*Continued from page* 42)

nose, a movable gun under the observer's hood and an under-defense gun pointing aft. It is a two-engined machine with twin rudders and fins having the almost circular outline of those on the PE-2. The engines are said to be the 12-cylinder M-38 type, though stated in this case to be 1100 hp.

The YAK-4 wings are a mixed steel tube and wooden structure, covered with plywood at some parts and fabric elsewhere, and has inset ailerons of rather small span and split flaps between the ailerons and the fuselage. The tail unit is of wooden stressed skin construction with a dihedral tailplane. All control surfaces have inset aerodynamic balances and trimming tabs.

Despite illustrations clearly indicating a general purpose two-seater, a Russian monoplane known as the SU-2 is said by the Germans to be capable of use as a four-gun single seater. In appearance it resembles such radial engined two-seaters as the Brewster Bermuda and the Curtiss Helldiver. The engine is said to be the 1100 hp M-88 double-row radial, but in some illustrations in the German press it seems to be the M-63, a single-row radial of 950 hp developed from the Wright Cyclone. A machine in much the same class is the R-10, which has the appearance of being the predecessor of the SU-2 with a Russian-built Wright Cyclone type engine.

Single-seat Fighters

The most advanced designs among single-seat fighters reported upon in Germany are the MIG-3 (I-61) and the YAK-1 (I-26). The first of these is a low wing monoplane of mixed construction, the outer sections of the wing and the rear of the fuselage being of wood, while the front section of the fuselage and the center wing section are of metal. The cockpit is notably far aft —only just forward of the root of the wings—though actually not so far aft as on earlier Russian fighters of similar type. The front and rear parts of the fuselage meet at the rear of the cockpit. The front part is built up of tubular longerons and cross members, covered by a number of light alloy demountable panels, while the rear is a stressed-skin wooden construction of rather angular cross section.

The armament of the MIG-3 specified by the Germans consists of three machine guns only, two 7.6 mm, and one 12.7 mm, mounted on top of the fuselage. But if this is not an understatement, it represents a surprising change of Russian policy in respect of fighters, for these were among the earliest to have a multi-gun armament—a 20 mm cannon and four machine guns.

The engine of the MIG-3 is said to be the AM-35A, a 1200-hp, 12-cylinder V-type developed from the 1000 hp M-34 designed by Toupolev. It has a steel tube mounting reminiscent of British practice. With header tanks under the cowl, there is a ducted radiator far aft under the fuselage. Two cylindrical oil coolers are curiously mounted in ducts at the sides of the crankcase. The wings are built round a single box spar located about 35 per cent chord from the leading edge. As mentioned above it is of mixed construction, the center section being of metal with light alloy skin, while the outer sections have wooden framework with plywood covering. There are all-metal split flaps, but the control surfaces generally have a light metal framing with fabric covering.

As regards the second modern fighter mentioned, the YAK-1, very little is known about this, and although there have been Russian reports of its having been in action on the North-Western front, there are no German reports about it. From its appearance in illustrations, however, it seems to be of original design (not a development of earlier Russian fighters) with a straight-taper wing and fabric-covered

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Physical testing machines and instruments for both static and dynamic strain measurement and stress analysis are included in our present line. If new physical testing problems have developed as a result of wartime conversion; if you're in a quandary over interpreting government specifications, Baldwin Southwark can help you get the answer.

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rear fuselage. The grouping of the exhausts suggests an engine of the Hispano Suiza type, possibly the M-103, which develops 950 hp at 11,500 ft.

Seaplanes

Russian designers do not appear to have gone far in the development of seaplanes. The Consolidated 28 (Catalina), built under license and known as the GST, has been used in the Black Sea, and although licenses were acquired awhile back for the Republic 2PA amphibian and the Douglas DF. flying boat nothing is known of the result.

There is a two-seated single-float Russian biplane seaplane of the general type used by the United States and Japanese Navies, known as the KOR-1, and some flying boats have been built revealing Italian (Macchi) influence. The latter include the ARK-3, built about five years ago with tandem air-cooled radial engines mounted on a pedestal above the center of the wing, with tractor and pusher airscrews. And there is the MBR-2, a monoplane used largely for sea reconnaisance, having a 700 hp liquid cooled V-type engines (BMW license) mounted as a pusher on struts over the wing and a maximum speed of about 140 mph.

New Developments in the Rubber Situation

(*Continued from page 29*)

Styrene from Ethyl Alcohol

An improvement in the production process for ethyl benzene, an intermediate in the production of styrene, which is one of the raw materials from which Buna S is produced, has been announced by the Atlantic Refining Company. Styrene is produced from ethyl benzene by a dehydrogenating process. Ordinarily ethyl benzene is produced from ethylene and aluminum chloride, both of which are strategic materials. By the new Atlantic Refining process it is made from ethyl alcohol and phosphoric acid, both of which are said to be non-strategic materials. It was pointed out in this connection that, owing to the decrease in the receipt of crude oil at the refineries on the eastern seaboard, there is considerable excess refinery equipment available which can be turned to use in the operation of the new process. The latter is really an adaptation of a process which has been used for years by the petroleum industry in the production of high-octane gasoline, which explains the possibility of readily converting the equipment to the new use. Atlantic Refining Co. has applied for patents on the process and has offered—through the Technical Advisory Committee of the Synthetic Rubber Committee of the Petroleum Industry War Council—to grant a royalty-free license for the duration of the emergency to any manufacturer desiring to use it in the interest of the Government's rubber program. Catalytic polymerization or similar equipment is necessary for working the process. Atlantic Refining Co. already has a pilot plant working and hopes to put a full-scale plant in operation soon. The cost of producing ethyl benzene by the new process is said to be slightly greater, but the fact that existing equipment can be used is claimed to outweigh this disadvantage.

One of the valuable properties of Butyl rubber is its high dielectric strength, which makes it valuable for the insulation of wires and cables, and one of the photographs reproduced shows equipment for measuring this property. Another view shows a number of miniature rubber mills, while the third is a general view showing various types of equipment.

Small Motor

A NEW small fractional-horsepower motor has been added to the line of General Electric motors for specific applications. The motor, designated BA-10, is designed for use with control and protective devices. It weighs only eight ounces.

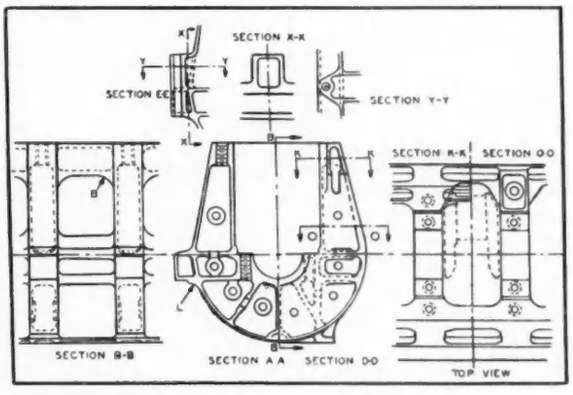

1
2
3
4
10
GALVAN-
IZING
ZINC IN WAR
Zinc Coated Steel Cables for Barrage Balloons
ADEQUATE GALVANIZING REQUIRED
The standard for U. S. Army and Navy purchases is *the best available*—and that is as it should be. Not only do our fighting forces deserve the best in performance, but quality insures obtaining full value for every war dollar. Typical of this economy are those war applications of iron and steel which involve corrosion problems. In such cases, *adequate* galvanizing (zinc coating) is required—because scant galvanizing wastes zinc, time and money.
The U. S. Bureau of Standards (Circular 80) states that zinc is "by far the best" protective metallic coating for the rust-proofing of iron and steel. Because zinc is above iron in the electromotive series, corrosion will attack zinc first, thereby protecting the iron from rust. Even though iron or steel is exposed in small areas such as at cut edges, in a protective coating, it is not corroded—if that coating is zinc.
Galvanizing serves the war program in many ways. Illustrated above and below are the all-important *galvanized steel cables on a barrage balloon*, and a few other typical examples of war galvanizing are shown in the background of this page: (1) portable steel landing field, (2) corrugated iron bomb shelter, (3) merchant marine wire rope hoist, (4) wire netting for camouflage. Not illustrated is the all-important zinc-coated pipe on ships.
It is the job of the zinc industry to see that sufficient zinc is available to provide *adequate* galvanized coatings for all-important war applications. This is a major reason why civilian users of metal and pigment may not be able to obtain all of the zinc they would like to have.
THE NEW JERSEY ZINC COMPANY
MANUFACTURERS OF THE FAMOUS HORSE HEAD ZINC PRODUCTS
1 HULL PLATES
2 RUBBER
3 PAINT
4 BRASS
5 CERAMICS
6 DIE CASTING
7 PHARMA-CEUTICALS
8 METAL SPRAYING
9 STAMPING DIES
FOR VICTORY
BUY UNITED STATES WAR SAVINGS BONDS STAMPS

How to Secure

Rigidity in Aluminum Crankcase

WE HAVE gradually learned that in order to make it possible for engines to operate smoothly at high speeds, all of their parts subjected to periodic forces must be designed to have the utmost rigidity. The aim for maximum rigidity for a given mass of material becomes especially urgent when aluminum is the material employed, for its coefficient of elasticity is less than that of cast iron, which means that an aluminum casting will deflect or yield more than a similar iron casting under the same load. The difference in the coefficients of elasticity could be compensated for by using thicker sections in the aluminum castings, but since the primary object in using aluminum is to save weight, that certainly would not be the proper procedure. On the contrary, the design should be so laid out that maximum rigidity is obtained with a given amount of material.

Recently there has been a tendency to adopt aluminum for Diesel engines in services where weight efficiency is important, and the Castings Department



Details of Diesel crankcase for production in cast aluminum.

of the Aluminum Co. of America has made a special study of the best distribution of material in crankcases to be cast of the light alloy. The following hints on the design of aluminum crankcases were given in an S.A.E. paper by Philip B. Jackson, engineer of the Castings Department. It may be that just now aluminum could be obtained only for engines essential to the war effort, but there is every indication that after the present emergency is over, owing to a large increase in production facilities, this metal will be plentiful and obtainable at reduced cost, and the same conditions which made it profitable to build the tanks of milk trucks, etc., of aluminum (because the load capacity is increased by the amount of weight saved) would seem to justify the use of the light alloy for engine and chassis parts.

(*Turn to page 78, please*)

SUNNEN Solves Another Problem

The Job

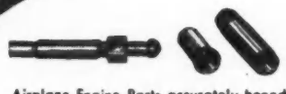
Collet — .305" hole, hardened. Stock removed .002". Tolerance — Minus .000" plus .001." Finish — 2 to 3 micro-inches — practically all parts tested on Brush Surface Analyzer for micro finish and inspected under Comparator. Previous method used — hand lapping.

Time saved by Sunnen Honing — 35%.

"Since installing our first Sunnen Honing Machine we have constantly added more and more parts to pass through the honing process. We now have six machines in use."

— Fidelity Machine Company

SUNNEN HONING provides a finish of 2 to 3 micro-inches — and at a saving of 35% in time!



Airplane Engine Parts accurately honed to a super-smooth finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Aircraft Valve Tappet Roller. 4-Micro finish.

"Produced an extremely accurate and glass-like finish."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Accuracy — and a super-smooth finish with a real increase in production which means a saving in cost. That's the record of the Sunnen "MA" Precision Honing Machine in the modern plant of the Fidelity Machine Company.

This one example is indicative of the many reasons why hundreds of leading manufacturers handling important war contracts have adopted Sunnen Honing.

Consider These Advantages

Wide range — handles internal diameters of .185" to 2.400". Accuracy within "one-tenth" guaranteed — has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

Put Sunnen Honing to work in *your* plant!

SUNNEN PRODUCTS CO., 7915 Manchester Ave., St. Louis, Mo.

Canadian Factory, Chatham, Ontario

Send for FREE BULLETIN

— Giving complete information. Or, if you prefer, a Sales Engineer will call and demonstrate this equipment in your plant, on your job.

SUNNEN

The drawing herewith is a cross section of a crankcase having basic stiffness worked into the design. The double horizontal ribs in place of the single rib result in better stress distribution, adding to the effectiveness of the box section. The box sections supply the needed rigidity, serve as manifolds for lubricating oil, and act as the engine-supporting flange. Section A-A through these ribs shows the blending of sections and generous fillets. The shape of the ribs may be seen in the top view. This shape is determined by clearance requirements for the path of the crankshaft and connecting rod. Large radii help to distribute loads quite uniformly through the entire length of the box section.

Section B-B, through the center of a main bearing, shows the double wall supporting the main bearing. This design provides excellent local rigidity for the main bearing as well as distributing bending loads in the entire casting. Thin and heavy sections occur as a result. Section A-A shows the ribbing under the main bearing. Holes in sections A-A are core supports and are located on or close to the neutral axis. The beads around the holes serve to avoid stress concentration resulting from possible core shift.

Top deck stiffness is obtained by the deep channel shown in Section D-D. The side view illustrates how the side walls of this channel blend into the vertical main-bearing webs. Sharp corners at point B would produce stress concentrations that might easily result in cracks and eventual total failure. The beading around the hand-hole opening provides more metal at a point of tensile stress. The increased periphery presents more surface over which to distribute the tensile loads.

Section E-E illustrates an alternate design for the engine mounting flange to provide greater strength at this point, where heavy impact loads are anticipated. Increased shear area is provided and the section modulus of Section X-X is far in excess of the original design. The additional material to provide greater strength at this point is exceedingly small in comparison to the total engine weight.

Turbo-Superchargers for Four-Stroke Diesels

AN ADVANTAGE claimed for the turbo-supercharger over the mechanically-driven type is that most of the power consumed by the former would otherwise go to waste in the exhaust. Not all of the power consumed is waste power, however, since the turbine introduces some back pressure in the exhaust and reduces the mean effective pressure. Brake mean effective pressures of 130 to 140 psi are being obtained from supercharged four-stroke diesel engines. When an engine is being fitted with a supercharger the total cost is about the same as that of an unsupercharged engine of the same output as the supercharged one, and at present the chief appeal of the supercharger is that it enables manufacturers having an established line of engines, to add capacities without additional expense for patterns, dies, tools, etc., by fitting their existing models with a supercharger.

Discuss your Cutting Oil Problems with a Cities Service Lubrication Engineer!

Due to war production and priorities, many manufacturers today are using new and unfamiliar materials—and each presents a new and unfamiliar cutting oil problem.

Unless these problems are solved quickly and economically, they can cost you real money in lost time, damaged equipment and poor results.

Why not have a Cities Service Lubrication engineer go over your cutting oil problems? You'll find he has up-to-the-minute information that can help you get maximum production . . . maximum tool life . . . and a better finish.

This friendly personal service is yours without cost or obligation. All you need to do is write on your own letterhead to the nearest Cities Service office listed below.

We shall be glad to send you an informative booklet, "Metal Cutting Lubrication." Just check the space indicated!

OIL IS AMMUNITION — USE IT WISELY!

CITIES SERVICE OILS
ONCE-ALWAYS

Write to —
CITIES SERVICE OIL COMPANY
Room 1326, Sixty Wall Tower, N. Y.

or any of the following offices:
CHICAGO . CLEVELAND . ST. PAUL
KANSAS CITY . BOSTON . TORONTO
or to
ARKANSAS FUEL OIL COMPANY
SHREVEPORT . ATLANTA . BIRMINGHAM

Please send me information concerning your Engineers' Service. ☐

Please send me your booklet, "Metal Cutting Lubrication." ☐ A.I.

Name_____

Firm Name_____

Address_____

City_____ State_____

A LUBRICANT FOR EVERY INDUSTRIAL NEED

Maintenance of American Aircraft with the RAF

(*Continued from page* 19)

cent were originally either unskilled or merely semi-skilled workers—mechanics from small garages, for instance.

But the gradual expansion of the repair and maintenance depot did not fulfill the urgent need for men with full knowledge of American aircraft to comprise at least part of the ground staff of every operational unit where American machines might be stationed. This requirement was met by organizing a separate school of maintenance specializing in American machines. A civilian chief instructor was chosen, E. R. Collins, from the College of Aeronautical Engineering (London and Brooklands). His initial staff of assistant instructors consisted of men showing special aptitude as such in the repair depot, but subsequently R.A.F.-trained instructors were added and these now form about half the staff.

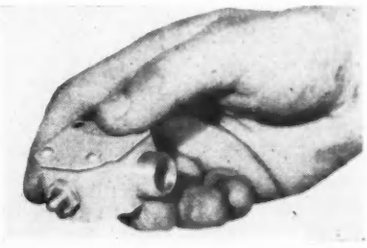
A large part of the trainees are men who pass out to increase the instructional staffs at other schools. Another large proportion are non-commissioned officers, from corporals upward in rank, who come from operational squadrons to take the courses applicable to the American aircraft or engines in use at the station to which they have been allocated. These are men fully trained in the various trades they represent—fitters, riggers, electricians, etc.—and it is merely the differences in practice between American and British machines wherein they require instruction. After return to their units they are able to supervise overhauls and day-to-day maintenance. The enrollment of the school also includes engineer officers, civilians from maintenance units and flight engineers from R.A.F. squadrons using such aircraft as Consolidated Catalinas and Cyclone-engined Stirlings.

The courses are intensive, and, besides being expected to take notes himself, each pupil is provided with what are termed "illustrated lecture notes" to take away with him. The courses cover Pratt and Whitney Twin Wasp engines, Wright 9- and 14-cylinder Cyclones, Allison engines of two types, Curtiss electric and Hamilton hydromatic propellers and the Holley carburetor (included in the Cyclone course). The Stromberg injection carburetor has a one-week course to itself; so have the exhaust-driven turbine supercharged and the Boston Havoc hydraulic system. Yet another course deals with American electric equipment in general.

For instruction relating to American airframes a number of machines are always available at the repair depot, including Douglas Bostons, Havocs, Marylands, Baltimores, Mohawks, Tomahawks, and Chesapeakes.

Lightweight Limit Switch

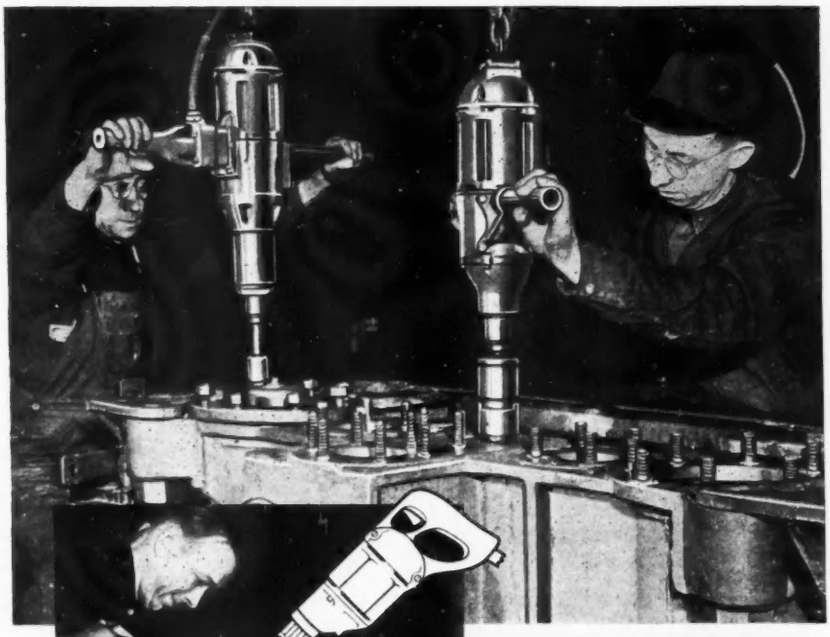
A NEW lightweight limit switch, the G-E switchette, built by the General Electric Co., Schenectady, N. Y., is designed to meet all Army Air Forces stipulations. The plunger of the aluminum-housed, dustproof switch



This new General Electric switchette is especially designed for use in aircraft.

operates with an overtravel of 7/32 in. Available in three contact arrangements: single-circuit, normally open or normally closed; and single-pole, double-throw.

"Materially speeding up our production," says this manufacturer of heavy marine equipment. "Thank you for the assistance in setting up our newly formed production line for the manufacture of War Units . . . At present using Black & Decker Stud Setters, Nut Runners (shown below), Drills, Scruguns and Grinders . . . Especially appreciate your prompt parts and repair service."



War Plants Report Big Time Savings

with BLACK & DECKER Portable Electric Tools

"INDISPENSABLE for constantly increased production," flashes one war-equipment manufacturer . . . "sanding time cut 50% to 75%," writes another user . . . "metal-cutting time trimmed 75%," says still another . . .

That's the report on Black & Decker Portable Electric Tools from the production front. For drilling, grinding, tapping, screw driving, sanding—for all kinds of production and assembling operations—Black & Decker Tools are powered to the job, built to "take it" on round-the-clock schedules. In the complete Black & Decker line there's a tool to fit every job that can be handled by portable electric equipment.

You, too, can have war production records like these reported here. Phone your Black & Decker Distributor. Or write direct to The Black & Decker Mfg. Co., 781 Penna. Ave., Towson, Md.

★

"Considerable time saved in drilling, tapping and grinding," reports a manufacturer of machinery. "Also a high percentage of increase in production. Black & Decker Tools stand up under tough usage. We are also able to obtain parts for replacement of worn ones without any hold-ups."

"20% time saving with Black & Decker Scruguns," reports a maker of cases for explosives. "Smoother operation and equal pressure insure uniformity in driving screws."

"Indispensable for constantly increased production of aluminum and steel equipment for Navy Ships and Maritime Commission cargo vessels," says a manufacturer, one of whose workmen is shown above using a Black & Decker Electric Sander.

Army Ordnance manufacturer finds a special wartime use for a Black & Decker Bench Drill Stand and Nut Runner. In a special mounting, this equipment provides power for winding hose reel for Army Ordnance Greasing Equipment.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

From Showcases to Ships . . . the Black & Decker Grinder shown here is grinding funnels for cargo ships—in a shop now converted from showcase manufacture to naval war production.

Cardox Airport Fire Truck

(*Continued from page* 35)

saved, it is recognized that it will be an advantage, even though such property saving is not considered as essential by aviation authorities.

Enhanced fire extinguishing characteristics are given to carbon dioxide when the temperature is thus controlled by refrigeration. For example, carbon dioxide at 0 deg. Fahr., will yield 45 per cent CO_2 snow on discharge. This yield can be compared with the characteristics of carbon dioxide stored at 80 deg. Fahr., which will produce only 20 per cent CO_2 snow. In this manner, greatly increased cooling is given to the CO_2 discharge. The most important advantage of the increased yield of CO_2 snow, however, is that it lends itself to projection, either across comparatively long distances or through strong cross-currents of air. This is apparent when it is considered that CO_2 snow has approximately 500 times the mass of CO_2 vapor.

Two large nozzles on the front of the Cardox Airport Fire Truck have a discharge capacity of more than one ton of liquid carbon dioxide per minute. One nozzle is mounted on the end of a long boom and can be tilted back and forth, while the boom itself can be raised or lowered or swung right or left. The second large nozzle is mounted immediately in front of the radiator and also can be swung right or left of pointed up or down. Both the direction and discharge of these nozzles is controlled by a set of three convenient joy sticks mounted on a panel in the driver's cab. Also on this panel is the discharge control of a linear ground sweep nozzle which stretches the full width across the front of the truck. This discharge equipment has the twofold purposes of building up ground concentration and throwing a protective, cooling screen which makes it possible for a truck to drive right into the heart of the fire.

In addition, two hose reels are mounted on either side of the truck, immediately behind the driver's cab. Each reel contains 100 ft of hose and is equipped with play pipe and nozzle. This discharge equipment gives airport firemen the flexibility and the ease of control similar to that of a small hand portable without the disadvantage of limited supply of CO_2.

Spitfire "V" Fighter In Production

(*Continued from page* 39)

cradle. The machine guns are mounted on the stirrups, but the fitting of the cannon is not done until later. Gun-heater tubing, of black cellulose-acetate, is next installed and the access doors for the machine guns are fitted in the upper surface of the wings. Finally, the wing is vacuum-cleaned internally and taken to an adjacent Carrier spraying booth for its first coat of grey paint.

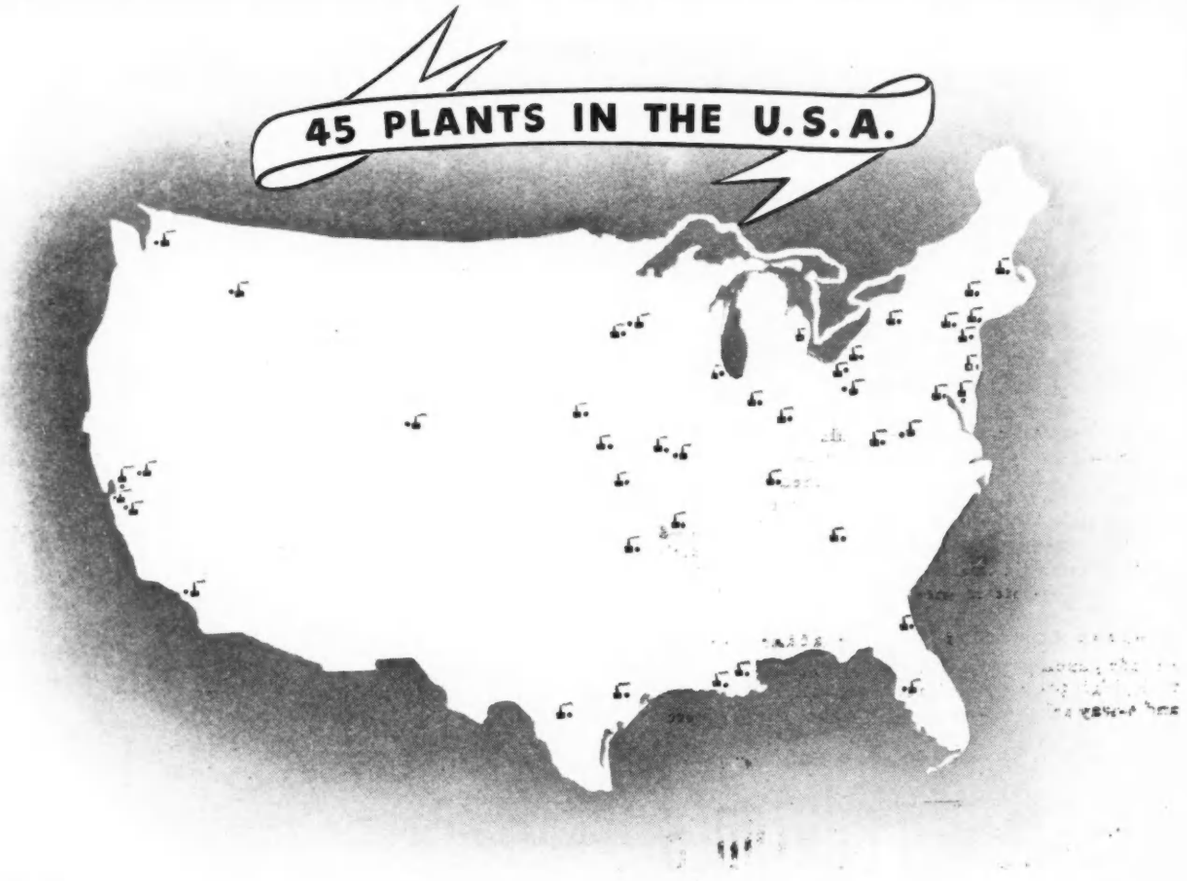
Formerly a fabric-covered structure, except for the nose, the aileron is now entirely covered with a metal skin in two stages and on two fixtures. Completed ailerons are statically balanced on knife-edges, the weight of the nose being suitably adjusted.

Makes Possible Better Batteries

Longer-lasting automotive batteries have been made possible by an amendment to Order M-112 permitting use of higher content of antimony in the manufacture of grids.

This action increases the permitted antimony content of alloys for grids from 7½ per cent by weight to 12 per cent, provided only secondary antimonial lead is used. Limitation on the manufacture of automotive batteries has resulted in an increasing supply of secondary antimonial lead.

work



Sales Offices in:

BALTIMORE, MD. CINCINNATI, O. DENVER, COL. DETROIT, MICH. HOUSTON, TEX. JACKSONVILLE, FLA. JERSEY CITY, N. J. KANSAS CITY, MO.
LOS ANGELES, CAL. MALDEN, MASS. MEMPHIS, TENN. NASHVILLE, TENN. NEW ORLEANS, LA. OMAHA, NEB. PASSAIC, N. J. PHILADELPHIA, PA.
ST. LOUIS, MO. ST. PAUL, MINN. SAN ANTONIO, TEX. SAN FRANCISCO, CAL. SEATTLE, WASH. SYRACUSE, N. Y. WHEELING, W. VA. WILKES-BARRE, PA.

Kanzler Leaves Detroit

(*Continued from page* 56)

his Detroit tour and witnessed the progress being made on a powerful new aircraft engine. Meanwhile in Washington, Harold E. Talbot, WPB aircraft production chief, said the new Dodge Aircraft Engine plant at Chicago is not scheduled to turn out its first Wright Duplex engine until next March and will not be in full production until the fall of 1943. Talbot made these remarks in connection with the current controversy over the production of huge cargo planes in former shipyards. He said every engine scheduled for production in the new Dodge plant already is allocated to a particular plane, so any diversion of engines to additional cargo planes would be at the expense of fighters and bombers already scheduled. Talbot said the high-output Wright engines that Dodge will manufacture in Chicago will be installed in Republic P-47 high altitude fighters and the huge new B-29 bomber which General Motors and Boeing will make. The Dodge Chicago plant is destined to contain five million sq. ft. of floor area, larger than the Ford Willow Run bomber plant. It is of a new type of reinforced concrete construction that saves greatly on steel.

General Motors' deliveries of war materials totaled $141,601,064 in June, a 16 per cent increase over May shipments. War material shipments for the first six months of 1942 totaled $628,439,152, representing a 369 per cent gain over the first half of 1941. The diminishing trend of civilian goods production by the nation's largest corporation is shown by a comparison of first and second quarter shipments this year. Commercial products constituted 41 per cent of GM output in the first quarter, with the other 59 per cent devoted to war goods. In the second quarter, with conversion of the automotive industry to war production nearing completion and civilian goods output curtailed by WPB edict, only 13 per cent of GM sales were commercial products and 87 per cent war equipment. Commercial product sales declined 65 per cent in the second quarter.

In regard to the raw material shortages that have curtailed war production in some plants. C. E. Wilson, president of GM, said he regarded such shortages as exaggerated and temporary, and he believes the situation will be quickly rectified if the government will carefully review the requirements of the war program with the view to a more orderly flow of materials to the manufacturers. Wilson blamed the tight material situation on use of such materials in construction, unbalanced inventories due to mass buying instead of on an "as needed" basis, and large lend-lease requirements.

Wilson said that present GM production is on contracts entered into before Pearl Harbor. Those signed after Dec. 7 are just getting into production and he looks for a big jump in war equipment output in September and October.

Only three GM plants, all in Michigan, have been affected by material shortages so far, according to Wilson. In these three plants employment was off 681 workers in a fortnight, while total employment in Michigan GM plants went up by 3294 workers during the same period.

Appointment of Kanzler as deputy chief of WPB in charge of program progress gives a promising outlook to the future, according to the GM president.

"I feel quite encouraged because Mr. Kanzler's production experience at the Ford Motor Co. and his recent experience as chief of the Automotive Branch make him well qualified," said Wilson. "I think in his new job Mr. Kanzler will be able to contribute to a better handling of raw materials. Real and effective progress is being made in the whole effort to achieve balance between production and military requirements."

Wilson noted that out of the industry's experience in keeping mass production rolling with a minimum of "float," especially between model years, an even better control of strategic materials can be achieved.